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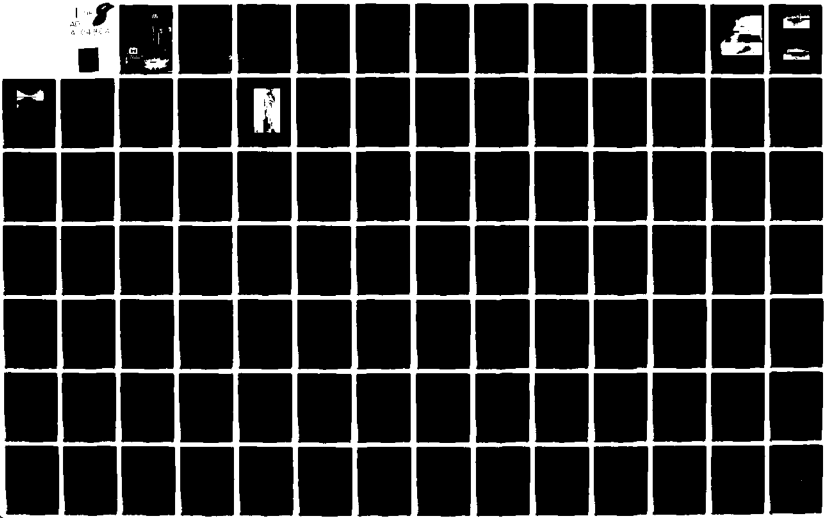

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Final Reformulation. Phase I.
General Design Memorandum
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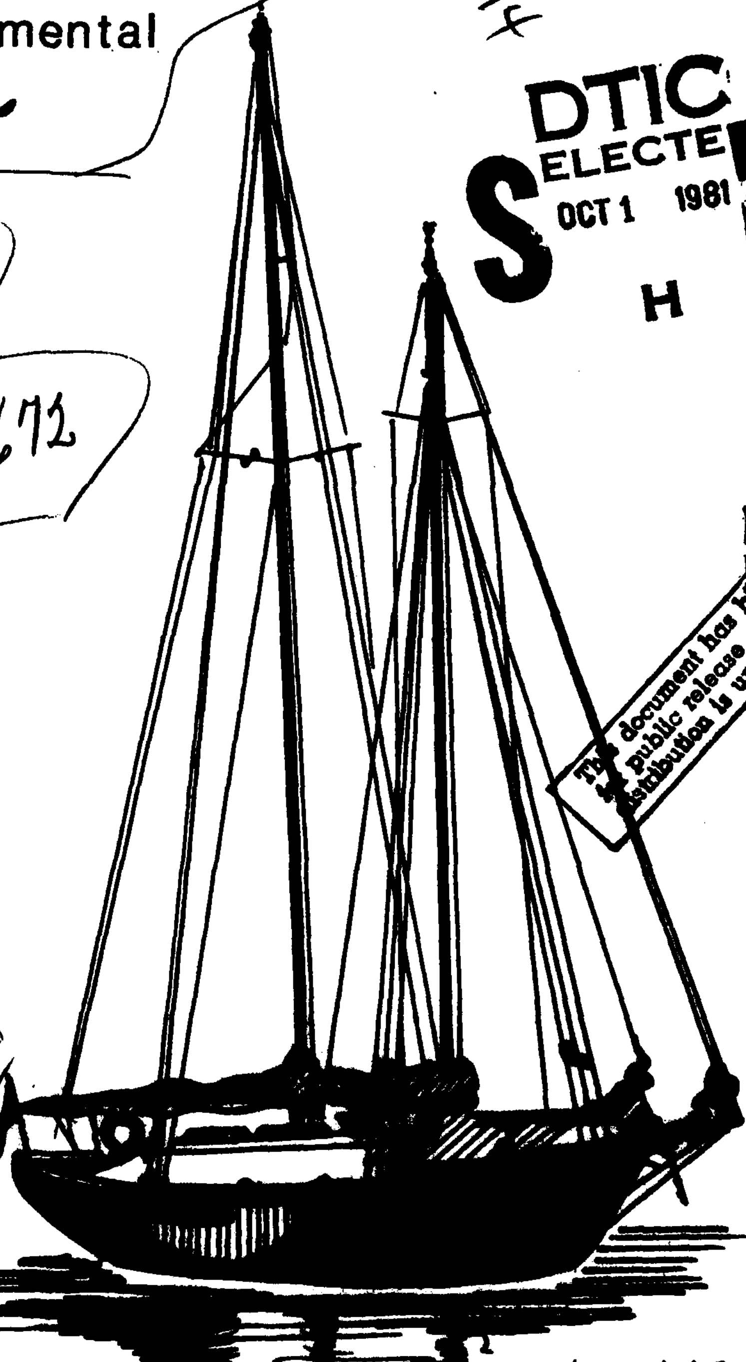

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Buffalo District

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SUMMARY

Geneva State Park, OH, is a multi-use recreational complex that provides, or will provide, opportunities for picnicking, camping, swimming, boating, fishing, and hiking. The primary water resources needs for which a solution was sought under this authority is provision of facilities for recreational navigation and shore-based fishing. As possible solutions to addressing these primary needs, an array of 10 structural solutions and one nonstructural solution, in addition to the "no-action" option, were initially identified. Of these 11 structural and/or nonstructural plans, seven were dropped from further consideration in the initial iteration, primarily because they did not satisfy the planning objective of providing an all-weather harbor at the site. Additional study of the remaining four alternatives during Stage 2 planning and subsequent assessment and evaluation at the beginning of Stage 3, indicated that only one alternative plan, Plan 3b (Modified Wetland/Parking Lot Harbor), warranted additional detailed study due to economic (cost) and environmental considerations. In addition, the basis of comparison for Plan 3b was the "no-action" (do-nothing) plan.

The emphasis in Stage 3 planning was therefore limited to refining Plan 3b. Principal considerations in this refinement were: the views of local boaters regarding channel depths, width, and aspect; mitigation of adverse environmental impacts; and modification of the configuration of the mooring area based on such factors as ODNR's preference for location of the launching ramps, service facilities and parking areas, and minimization of destruction of the existing wetland area. Following completion of this refinement, the impacts of Plan 3b were then compared to the impacts of the "no-action" (do-nothing) plan.

Based on the results of the Stage 3 planning effort, it was determined that Alternative Plan 3b was economically justified and environmentally viable. It was both the NED Plan and the plan least damaging to the environment (an EQ Plan could not be designated for this study since no alternative provided net contributions to the EQ account). Plan 3b was the only plan acceptable to both the Ohio Department of Natural Resources, the local sponsor, and the U.S. Fish and Wildlife Service. Plan 3b was also acceptable to the local boating community. In addition, since wetlands destroyed by Plan 3b would be replaced in kind, Plan 3b was in compliance with Executive Order 11990 (Protection of Wetlands). For these reasons, it was concluded that Alternative Plan 3b (Modified Wetland/Parking Lot Harbor) should be implemented at an estimated first cost of $5,816,000 on August 1981 price levels.

GENEVA-ON-THE-LAKE
SMALL-BOAT HARBOR

FINAL REFORMULATION PHASE I GDM

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ACKNOWLEDGMENTS

This Final Reformulation Phase I GDM was prepared through the efforts of many individuals on the Interdisciplinary Team within the Buffalo District of the Corps of Engineers and from other agencies and individuals involved with the Geneva-on-the-Lake Small-Boat Harbor project. The following are the Corps personnel who were most instrumental in conducting the investigation and preparing the text presented herein:

Richard Aguglia	- Project Manager, Western Basin
John Zorich	- Chief, Western Basin
Steve Golyski	- Project Engineer, General Engineering
Joan Pope	- Coastal Geologist
Richard Gorecki	- Civil Engineer
Sharon Cooper	- Economist
Melvin Hill	- Geologist
Cynthia Lamothe	- Geotechnical Engineer
Philip Berkeley	- Biologist
Mary Jo Braun	- Social Scientist
Robert Klips	- Biologist
William Butler	- Social Scientist
Richard Lewis	- Archaeologist
Jonathan Koszuta	- Survey Technician
Duane Syph	- Party Chief, Survey Branch
Bradford Price	- Chief, Hydrologic Investigation Section

Other agencies have contributed to this report through the preparation of supplemental reports and participation in agency workshops. The individuals involved are numerous and not easily identified. Therefore, recognition is provided by the names of their employing agencies as follows:

U. S. Fish and Wildlife Service, Columbus, OH, Field Office
Ohio Department of Natural Resources
United States Coast Guard, Ninth Coast Guard District

The report itself was produced through the efforts of many other Corps personnel, including the following who contributed significantly to its preparation:

Roman Bartz	- Chief, Drafting Section
Christine Kosinski	- Drafting Section
John Acker	- Drafting Section
Mary Hamilton	- Drafting Section
Freda Soper	- Chief, Word Processing Center
Lillian Stryczek	- Word Processing Center
Linda Jones	- Word Processing Center
Margaret Friedman	- Word Processing Center
Mary Ann Schultz	- Word Processing Center
George Key	- Chief, Reproduction Section

The Buffalo District Engineer during preparation of this Final Reformulation Phase I GDM was Colonel George P. Johnson, the Chief of the Engineering Division was Donald M. Liddell, and the Chief of the Planning Branch was Charles E. Gilbert.

Finally, the efforts of other individuals who participated in the study and report preparation but whose names have not been mentioned above, are gratefully acknowledged.

SECTION I

INTRODUCTION

The purpose of this section is to introduce the reader to the Geneva-on-the-Lake Small-Boat Harbor study and to explain the content and organization of this report. The section presents information on the geographical setting of the study area, the study authority, the purpose of the study, the scope of the study, study participants and coordination, the organization of the report and information on other ongoing Corps of Engineers investigations in the area.

GEOGRAPHICAL SETTING

Geneva-on-the-Lake, as shown on Plate 1 in Appendix H, is located on the south shore of Lake Erie about 17 miles east of Fairport Harbor, OH, and 12 miles west of Ashtabula Harbor, OH, both of which are Federally improved deep-draft harbors. Geneva-on-the-Lake was identified as a promising location for a small-boat harbor and harbor-of-refuge because of its strategic location within the boundaries of a State recreational park which is presently still being developed by the State of Ohio, its strategic location with respect to existing harbors, its proximity to productive fishing grounds and the appreciable boating demand within the tributary area.

Plate 2 in Appendix H is a map showing the existing and proposed recreational development at Geneva State Park. When completed, the park will encompass approximately 725 acres and will provide opportunities for camping, swimming, boating, fishing, picnicking, and hiking. Facilities completed to date include a bathhouse pavilion, picnic tables, cooking grills, lavatory facilities, a pedestrian foot bridge crossing Cowles Creek, and 12 housekeeping cabins. Pictures of some of these facilities are shown in Figures 1 to 4. The park is easily accessible from Interstate 90 and State Route 534 through the city of Geneva and the village of Geneva-on-the-Lake.

STUDY AUTHORITY

Congressional Authority

Section 6 of Public Law 79-14, approved 2 March 1945, authorized and directed the Secretary of War to cause preliminary examinations and surveys to be made on the south shore of Lake Erie with a view to the establishment of harbors and harbors-of-refuge for light draft commercial and fishing vessels and for recreational craft. In partial compliance with this authority, a comprehensive preliminary examination report, favorable to 33 locations on the coast of Lake Erie, was submitted on 19 July 1946. Preparation of survey reports thereon was authorized by the Chief of Engineers on 20 December 1946.

An Interim Report, completed in February 1969, examined the feasibility of constructing a small-boat harbor at Geneva-on-the-Lake, OH, which was being developed by the State of Ohio as a State Park. The Geneva-on-the-Lake site was not originally included in the preliminary examination report completed

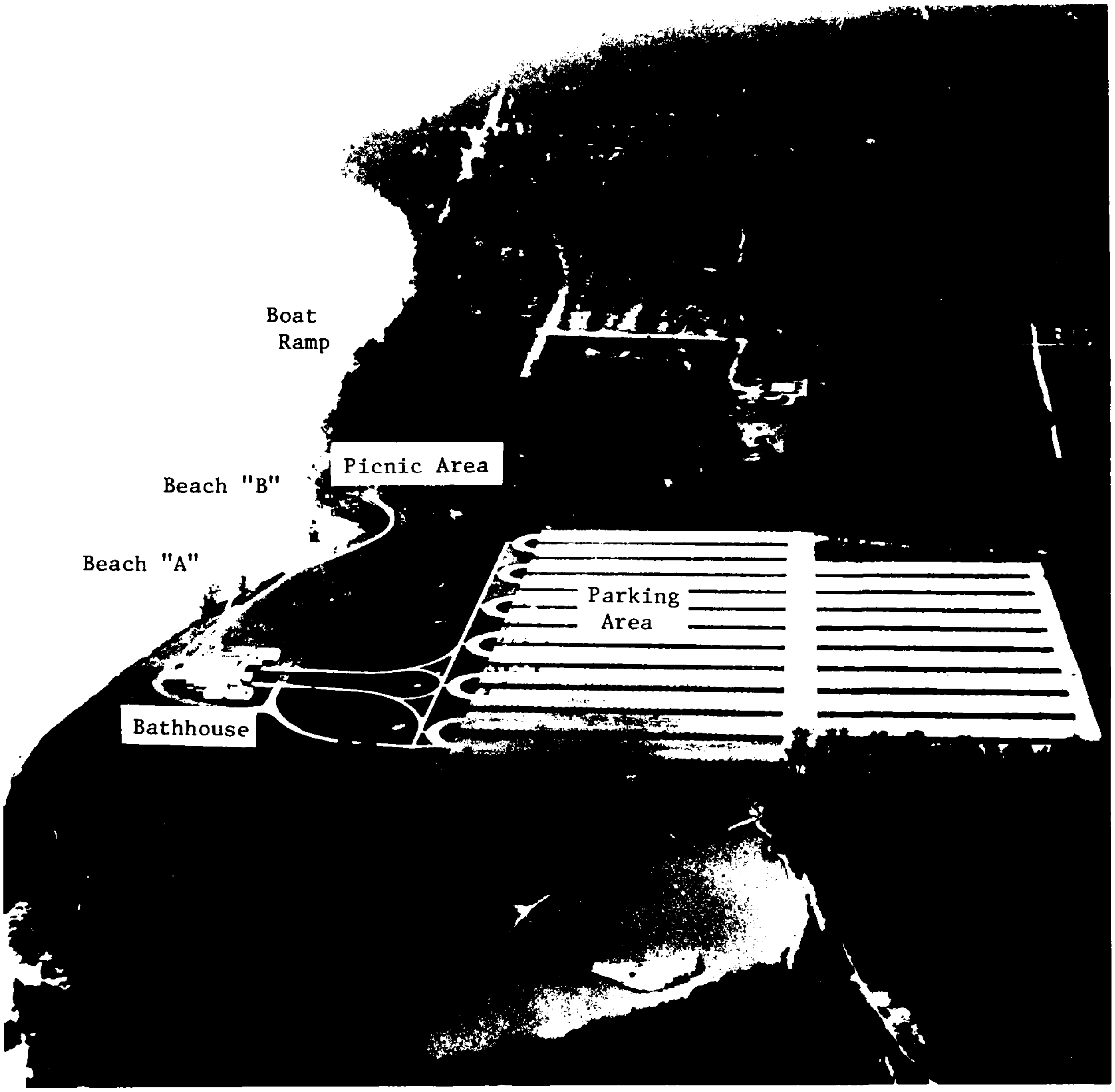

Figure 1: Aerial photograph of the eastern end of Geneva State Park (photo taken 6/75).

Figure 2: Picnic area and change booths near Beach "B" (photo taken 11/77).

Figure 3: Bathhouse Pavilion (photo taken 11/77).

Figure 4: Pedestrian foot bridge crossing Cowles Creek (photo taken 11/77).

in 1946. It is a substitute site for Arcola Creek, as suggested by the State of Ohio and approved by the Division Engineer, North Central Division. The site is approximately 2 miles east of Arcola Creek.

The Interim Report gave a favorable recommendation for the harbor project and the results were published in House Document No. 91-402. The project was subsequently authorized for construction under Section 201 of the 1965 Flood Control Act (Public Law 89-298) by the House and Senate Committees on Public Works by Resolutions dated 15 December 1970 and 17 December 1970, respectively. Funds to initiate the Advanced Engineering and Design of the project were appropriated in Fiscal Year 1978.

Description of Authorized Project

The project, as authorized, would provide a small-boat harbor and harbor-of-refuge and recreational fishing facilities as an integral part of the State Park at Geneva-on-the-Lake. The plan recommended in House Document No. 91-402, and shown on Plate 3 in Appendix H, would provide for:

(1) Breakwaters in Lake Erie aggregating about 1,400 feet in length, with a riprapped spending beach between the entrance channel and the inner end of the west breakwater;

(2) An entrance channel about 1,000 feet long and varying from 180 to 100 feet in width, 8 feet deep for the outer 500 feet and 6 feet for the inner, extending from the 8-foot depth in the lake into the dock channel;

(3) A dock channel, 100 feet wide, 1,500 feet in length, and 6 feet deep, widened to 200 feet at the junction with the entrance channel; and

(4) Development of recreational facilities.

Items of Local Cooperation in Authorizing Document

Authorization for these improvements was made subject to the requirement that local interests agree to:

(1) Provide without cost to the United States all lands, easements, and rights-of-way required for construction and subsequent maintenance of the project and for aids to navigation upon the request of the Chief of Engineers, including suitable areas determined by the Chief of Engineers to be required in the general public interest for initial and subsequent disposal of spoil, and also necessary retaining dikes, bulkheads, and embankments therefor or the cost of such retaining works;

(2) Hold and save the United States free from damages due to the construction and subsequent maintenance of the improvements;

(3) Provide and maintain necessary access roads, mooring facilities, and parking and service areas, including a launching ramp, all essential sanitary facilities, and an adequate public landing or wharf, with provisions for the

sale of motor fuel, lubricants, and potable water, available to all on equal terms;

(4) Provide and maintain depths in the service channels to principal docks and berthing areas commensurate with those provided in the Federal project;

(5) Accomplish without cost to the United States such relocations or alterations of utilities as necessary for project purposes;

(6) Establish rules to control the use, growth, and development of the harbor and related facilities, with the understanding that public facilities will be open to all on equal terms;

(7) Reserve spaces within the harbor adequate for the accommodation of transient craft;

(8) Establish regulations prohibiting discharge of pollutants into the waters of the harbor area by users thereof, which regulations shall be in accordance with applicable laws or regulations of Federal, State, and local authorities responsible for pollution prevention and control;

(9) Contribute in cash 50 percent of that portion of the first cost of Federal construction allocated to recreational navigation, exclusive of aids to navigation, a contribution presently estimated at $576,000 1/ on December 1968 price levels, to be paid in a lump sum prior to initiation of construction, or in installments over the construction period at a rate proportionate to the proposed or scheduled expenditure of Federal funds, as required by the Chief of Engineers, the final apportionment of cost to be made after actual costs have been determined;

(10) Contribute in cash one-half of the cost of modifications necessary to provide for recreational fishing from the breakwaters, an amount currently estimated at $29,000 2/ on December 1968 price levels; and

(11) Bear all costs of maintenance, operation, and replacement of these modifications for recreational fishing, an amount currently estimated at $1,900 on December 1968 3/ price levels on an average annual basis;

And provided further, that the improvement for navigation may be undertaken independently of providing public recreational facilities for breakwater fishing whenever the required local cooperation for navigation has been furnished.

Prior to the submission of the 1969 Interim Report on Geneva-on-the-Lake to Congress, the Chief of Engineers recommended that maintenance of the general navigation features be an item of local cooperation. This item of local

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1/ $1,901,000 on October 1980 price levels.

2/ $99,000 on October 1980 price levels.

3/ $8,300 on October 1980 price levels.

cooperation was later eliminated by the authorizing Congressional Resolutions of December 1970 to conform to Section 103 of the River and Harbor Act of 1970 (PL 91-611) whereby the costs of operation and maintenance of the general navigation features are to be borne by the United States and thus will not be an item of local cooperation.

The local cooperator for the project is the Ohio Department of Natural Resources (ODNR). Recent correspondence with ODNR indicating their willingness to provide the local cooperation is included as Exhibits E-1, E-2, and E-3 in Appendix E, "Pertinent Correspondence."

PURPOSE OF REFORMULATION PHASE I GDM STUDY AND THE FINAL REFORMULATION PHASE I GDM REPORT

Reformulation Phase I GDM Study

Several legislative and physical changes, having a direct influence on the feasibility of constructing the authorized project, have occurred since the 1969 Interim Report was submitted to Congress and subsequently authorized for construction. These changes, depicted on Plate 4 in Appendix H, and developed in greater detail in Section II of the Main Report include: the construction of a parking lot at the location originally proposed for the mooring area, and the expansion of an existing wetland area within the location originally proposed for the launching area and turning basin with increased emphasis through legislative changes on preservation of wetland areas for environmental reasons. Figure 5 is an aerial view of the proposed harbor area with the authorized project superimposed upon it.

The purpose of this Reformulation Phase I GDM study was to reaffirm the viability of the 1969 plan in light of the changes that occurred at the site since the project was authorized for construction, to develop a modified plan, or to recommend an entirely different plan (including "no action"), if a different plan more nearly satisfied the criteria of engineering, environmental, economic, social, financial, and political feasibility. Reformulation was necessary because of the probable adverse environmental impact to the existing wetland area in the location where the authorized project was to be constructed. Methods to minimize the environmental impacts that were investigated included relocating the harbor to avoid or reduce the amount of wetland area disturbed, enhancement of the existing wetland area not affected by the harbor, and creation of additional wetlands. An Environmental Impact Statement, that addressed the existing physical condition at Geneva State Park and conformed with current policy and legislation, was also prepared. The Environmental Impact Statement assessed, among other things, the impacts of the recommended plan on the existing wetland area.

Revisions to the authorized plan were also investigated to reduce the impact of the authorized project on an existing parking lot that was constructed by the State of Ohio to serve the beach at Geneva State Park after the 1969 Interim Report was submitted to Congress and subsequently authorized for construction. At the time the parking lot was constructed it was felt that the mooring area could be reoriented and "flipped" 180° in

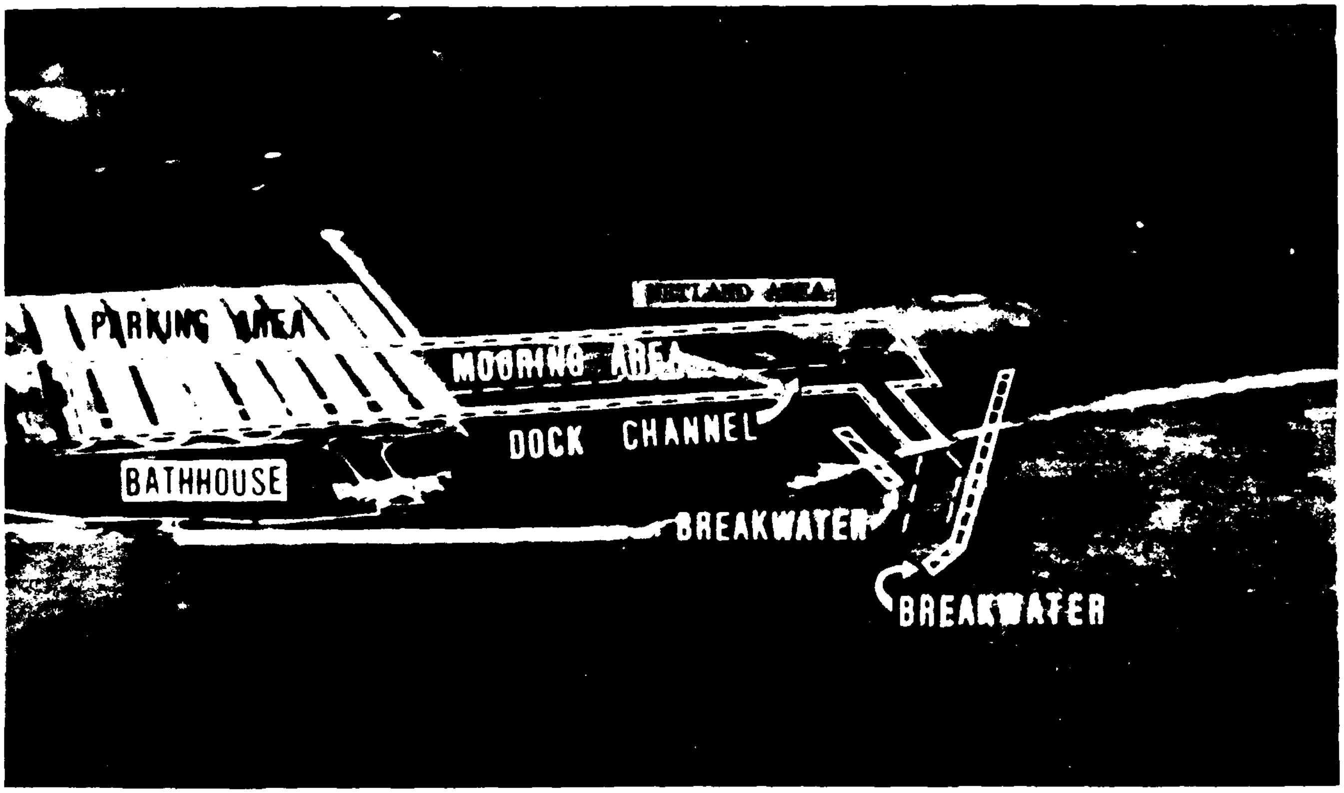

Figure 5: Aerial view of Geneva State Park with the authorized small boat harbor superimposed upon it (photo taken 8/76).

relation to the entrance channel. If this course of action were to be taken, however, the mooring area would encroach on the existing wetland area. As discussed above and developed in greater detail in Section II of the Main Report, this encroachment posed severe environmental concerns that were not anticipated when this parking lot was constructed. The reformulation study therefore investigated alternatives which minimized the impact of the harbor on the parking lot while at the same time minimizing the impact of the harbor on the environment.

Correspondence regarding the need for a Reformulation Phase I GDM and approval to conduct a reformulation study is provided as Exhibits B-12 and B-13 of Appendix B in the approved Plan of Study for the Geneva-on-the-Lake, Ohio Small-Boat Harbor Study, April 1978 (Revised August 1978).

Final Reformulation Phase I GDM Report (Final Stage 3 Report)

The purpose of this Final Stage 3 Report is to present the results of the Stage 3 planning effort to refine and assess the impacts of the alternative plans recommended for additional detailed study at the conclusion of Stage 2 planning (development and analysis of a wide range of preliminary alternative plans). As will be discussed in greater detail in Section III of the Main Report ("Formulation of Preliminary Plans"), the alternative plans recommended for additional detailed study were Alternative Plan 2 (Offshore/Onshore Harbor) and Alternative Plan 3 (Wetland/Parking Lot Harbor). In addition, as with any potential water resources project, Alternative Plan 5 (No-Action) was also carried forward in the event that more detailed studies showed that no structural and/or nonstructural plan could be implemented because of the absence of engineering, economic, environmental, financial, social, or political viability. Plan 5 was also used as the basis-of-comparison in evaluating the structural plans under consideration. Additional evaluation and assessment of these structural plans, subsequent to completion of Stage 2 studies, indicated that Alternative Plan 2 should also be eliminated from further consideration. Thus, no additional studies were completed for Alternative Plan 2 during Stage 3 planning. The rationale for eliminating Plan 2 from further consideration is discussed in detail in Section IV of the Main Report ("Assessment and Evaluation of Detailed Plans").

The emphasis in Stage 3 was therefore placed on refining Plan 3. The principal considerations in this refinement were: the views of local boaters regarding channel depths, width, and aspect; mitigation of adverse environmental impacts; and modification of the configuration of the mooring area based on such factors as ODNR's preference for number of berthing spaces and location of the launching ramps, service facilities and parking areas, and minimization of destruction of the existing wetland area. Following completion of this refinement, Plan 3 was then compared to Plan 5 (No-Action) in order to assess its impacts.

At the conclusion of this Final Stage 3 Report, a recommendation will be made as to whether or not a small-boat harbor plan should be implemented at Geneva State Park. This recommendation has been coordinated with the general public and affected governmental agencies.

SCOPE OF THE STUDY

General

As previously discussed, the Geneva-on-the-Lake site for a small-boat harbor was not originally included in the preliminary examination report completed in 1946. It is a substitute site for Arcola Creek, as suggested by the State of Ohio and approved by the Division Engineer, North Central Division. The site is approximately 2 miles east of Arcola Creek.

At the initial workshop meeting for this study on 15 December 1977, the Ohio Department of Natural Resources, the local sponsor for the project, stated that they were opposed to acquiring any additional land outside the boundaries of the State Park for a small-boat harbor. They also stated that due to existing and future park development, the only area available for a small-boat harbor was between Cowles Creek and the wetland area to the west of the existing parking lot (see Plate 2 in Appendix H which is a map showing the existing and proposed recreational development at Geneva State Park). Therefore, with the exception of a possible mitigation site as discussed below, the scope of this study was limited to the area between Cowles Creek and the wetland area at Geneva State Park. (Minutes of this workshop meeting are included as Exhibit F-1 in Appendix F, "Public Involvement").

Field Investigations

Several field investigations, as discussed below, were conducted for this Phase I study. These investigations included: (1) a geophysical survey and auger borings to establish the location of top of rock in the study area; (2) a bathymetric survey to establish offshore conditions; (3) a topographic survey to establish onshore conditions; (4) a Cultural Resources Reconnaissance study to identify historical sites in the study area; (5) a boating facilities inventory along the south shore of Lake Erie; and (6) a biological data collection program to provide sufficient biological data to assess the effects of the alternatives on the existing environment.

(1) Geophysical Survey - The final location, size, and shape of a small-boat harbor at Geneva State Park will be highly dependent on the location of top of rock which is near the earth's surface in much of the area. The location of the authorized project was chosen to minimize the amount of rock excavation and consequently minimize the construction cost of the project. Rock probings indicated that the authorized project could be constructed with little or no rock excavation. Any alternative location to the authorized project location must minimize the amount of rock excavation because of associated high construction costs that would jeopardize the economic feasibility of a small-boat harbor at Geneva State Park. For this reason, the Corps undertook a seismic survey of the study area through a contract with Warren George, Inc. of Jersey City, NJ. The results of this seismic survey are presented in Appendix A, "Geology, Soils, and Construction Materials."

(2) Bathymetric Survey - A bathymetric survey was undertaken by Buffalo District personnel in the summer of 1977 and supplemented by additional survey work completed in the fall of 1978 and the spring of 1979. The purpose of this survey was to establish the offshore bottom contours in the study area. This information was required for the wave refraction studies used to design the breakwaters for each alternative plan and to allow an estimate to be made of the quantity of construction dredging that would be required for each alternative. In addition, while conducting the bathymetric survey, District personnel obtained samples of the lake bottom sediment for laboratory analysis. This information was required in order to develop a sediment budget for the study area and to estimate future maintenance dredging requirements for a small-boat harbor at Geneva State Park. Results of the bathymetric survey and sediment sampling program are presented in Appendix A.

(3) Topographic Survey - A topographic survey was undertaken by Buffalo District personnel in the fall of 1979 to establish ground contours in the study area. This information was required in order to accurately prepare excavation quantity estimates used to determine the construction cost of each alternative.

(4) Cultural Resources Reconnaissance Study - Due to the lack of current cultural resources information in the study area, a Cultural Resources Reconnaissance study was conducted through a contract with P/RA Research, Inc. of East Meadow, NY. The purpose of this study was to locate and assess known and unknown cultural resources sites and objects within the impact areas of the small-boat harbor alternatives under consideration. The results of the investigation indicated that the study area did not contain significant cultural materials and that a small-boat harbor could be constructed without further concern for its impact on cultural resources. A copy of P/RA Research, Inc.'s report is provided in Appendix G, "Reports of Others," as Exhibit G-1.

(5) Boating Facilities Inventory - As part of the International Joint Commission's Lake Erie Regulation Study, a boating facilities inventory was conducted along the coast of Lakes Erie and Ontario and their connecting waterways by Midwest Research Institute of Kansas City, MO, during 1979. The purpose of this inventory was to establish the existing supply of small-boat facilities within their area of study. Although the boating facilities inventory was not conducted for this Phase I study, information on the existing supply of small-boat facilities (number of permanent mooring spaces and number of launching ramps) along the coast of Lake Erie in Ashtabula County was extracted from their report. This information was required in order to determine the unfulfilled demand for small-boat facilities in Ashtabula County (total demand minus existing supply).

(6) Environmental Studies - Due to the lack of current biological information in the study area, the U.S. Fish and Wildlife Service (Columbus, OH, Field Office) was requested to conduct a four-season survey on the Cowles Creek/wetland area/Lake Erie complex for the Buffalo District through an interagency support agreement. The objectives of this study were to: (1) identify species composition, density and distribution of the flora and fauna

in the area; (2) identify and evaluate the habitat important for major taxonomic groups; and (3) provide data and information that would allow assessment of the impacts of any structural plans that were considered. This inter-agency support agreement was later modified to include biological data collection for Wheeler Creek at the west end of Geneva State Park. This area was identified by ODNR as a possible site for mitigating any loss of existing wetland area due to the construction of the small-boat harbor.

The data collection program was started in the fall of 1978 and completed in the fall of 1979. The results of the study are presented in Appendix G, as Exhibit G-2. This biological information was then used to assess the effects of the alternatives investigated for this Phase I study on the existing environment at Geneva State Park.

Office Investigations

Several office studies, as discussed below, were also conducted for this Phase I study. These studies included: (1) a regional boating demand analysis to establish recreational boating needs in the area; (2) a regional fishing demand analysis to establish recreational fishing needs in the area; (3) a wave refraction analysis to establish deep-water wave conditions used for design of the breakwaters for each alternative; (4) a littoral study to establish the predominant littoral currents in the study area; (5) a hydraulic model study of the preferred small-boat harbor alternative in order to determine the most economical breakwater configuration which would provide a safe entrance and adequate protection for small craft in the mooring area; (6) a hydrologic investigation to determine the peak 100-year discharge for the intermittent stream that runs through the wetland area; and (7) a geotechnical study to evaluate subsurface conditions and their impact on the proposed project.

(1) Regional Boating Demand Analysis - Various current and projected socioeconomic variables such as income level, household size, leisure time, and population were assembled and analyzed to forecast existing and future demand for permanent boat moorings and trailered boat launching facilities in the Ashtabula County area. This demand forecast was then used to develop the anticipated fleet mix (size and type of boat) that could be expected to use a small-boat harbor at Geneva-on-the-Lake. The anticipated fleet mix was then used to estimate benefits that would accrue due to construction of a small-boat harbor and to determine the size of the required mooring area and new harbor facilities such as launching ramps, sanitary facilities, etc., required for optimum use of the small-boat harbor. The results of this regional boating demand analysis are presented in Appendix D, "Economic Evaluation."

(2) Regional Fishing Demand Analysis - The same current and projected socioeconomic variables analyzed for the regional boating demand analysis were also used to estimate the demand for fishing activity days in the Ashtabula County area. A monetary value for each activity day was then developed for existing conditions (shoreline fishing) and improved conditions (breakwater fishing). This information was then used to estimate the benefits that would result from providing breakwater fishing facilities as a part

of the small-boat harbor at Geneva State Park. The results of the regional fishing demand analysis are presented in Appendix D, "Economic Evaluation."

(3) Wave Refraction Analysis - The wave refraction analysis developed for the Geneva State Park Shoreline Erosion Demonstration Project (discussed later in this section) was modified to provide an analysis for the shoreward propagation of the design deep-water waves at Geneva State Park for this Phase I study. This information was required in order to design the breakwaters for each alternative investigated and to define the deep-water wave at the boundary of the hydraulic model. The results of this analysis are presented in Appendix B, "Design and Coastal Processes."

(4) Littoral Study - A littoral study was conducted to determine the quantity of sediment annually transported in the nearshore system at Geneva State Park. This information was required in order to estimate the annual maintenance dredging requirements for a small-boat harbor and to assess the erosive effects of the harbor structures on the adjacent shoreline areas. The results of this study are presented in Appendix B.

(5) Hydraulic Model Study - A model study of the recommended small-boat harbor alternative at Geneva State Park will be necessary in order to provide a safe entrance and to determine the most economical breakwater configuration which will provide adequate protection for small craft in the harbor. The model is also needed to determine the resultant wave heights in the harbor mooring area since the complex wave actions cannot be accurately determined mathematically. The model will also provide qualitative information on the effects the breakwaters will have on the littoral processes.

The Corps Waterways Experiment Station (WES) was requested to perform this model study and completed construction of the physical model in October 1980. Initial testing of the recommended alternative was then started in November 1980. However, because the model study could not be started before Stage 3 plan formulation was completed (in order to avoid major changes to the harbor plan after the model study was completed), results of the model study were not available for this Phase I effort. The test results will, however, be used in final design of the recommended harbor plan during the Phase II GDM study.

(6) Hydrologic Investigation - As will be discussed in Section IV of the Main Report (Assessment and Evaluation of Detailed Plans), a mitigation plan was developed to offset environmental impacts of the alternative harbor plan carried forward into Stage 3 planning. Included in this mitigation plan was a water control structure at the mouth of the intermittent stream that runs through the wetland area. The purpose of the structure was to artificially regulate the level of water in the wetland area since the harbor plan would modify the natural processes responsible for maintaining the present levels. The overflow section of this water control structure was sized to safely pass the 100-year peak flood discharge without causing upstream flooding. This 100-year peak flood discharge was estimated to be 800 cubic feet per second, resulting in an overflow section width of 120 feet. Additional details on this investigation are provided in Appendix B1, "Hydrology and Hydraulic Design."

(7) Geotechnical Study - Results of the geophysical survey and auger borings and information from earlier studies were evaluated to assess the impact of subsurface conditions on the considered alterantives in order to minimize rock excavation. A material survey was also conducted to determine the availability of various stone materials. Additional details on this study are provided in Appendix A , "Geology, Soils, and Construction Materials."

STUDY PARTICIPANTS AND COORDINATION

Public Involvement (Including Coordination of the Draft Reformulation Phase I GDM and Draft EIS, February 1981 (Revised April 1981))

On 22 March 1978, a public meeting was held in Geneva, OH, to solicit information from the general public and insure a fully coordinated Plan of Study. Participants were given the opportunity to express their views on the project and to provide a sketch of the harbor they felt would best suit their needs. Statements made at this meeting indicated strong public support for construction of this project at the earliest possible time. A copy of the public meeting announcement, along with the information packet on the Geneva-on-the-Lake project and the public responses received, are included in Appendix C of the Plan of Study for this project.

Both the completed Plan of Study and the Stage 2 Document, July 1979 (revised April 1980) for this project were distributed to the political leaders in the area and to various local, State, and Federal agencies for their review and comment. Loan copies of the reports were also supplied to local libraries for review by the general public and various civic groups. In addition, until the supply was exhausted, personal copies of the reports were made available to study participants free of charge. With the exception of requests for additional copies, no comments were received on either report.

During Stage 3 planning, a preliminary Section 404 Evaluation and Public Notice was also prepared and distributed to the political leaders in the area, various governmental agencies and the general public. The purpose of this notice was to identify what dredged or fill materials would be discharged into waters of the United States by implementation of the proposed project and to provide an opportunity for any person affected by such discharge to request a public hearing. A copy of this notice, including the preliminary Section 404 Evaluation, is provided in Appendix F ("Public Involvement") as Exhibit F-2a, and a copy of the final Section 404 Evaluation is provided as Exhibit F-2b.

Two responses were received as a result of the preliminary Section 404 Evaluation and Public Notice. The first response was from the Environmental Protection Agency - Region V (Exhibit E-4 in Appendix E). In their response, EPA stated their need for additional information before responding to the Public Notice. This additional information was provided in the Draft Stage 3 Report which was provided to EPA following approval of the report by the Division Engineer, North Central Division. EPA's subsequent comment letter on the Draft Stage 3 Report (including Draft EIS), dated 15 July 1981, is provided in Appendix E, "Pertinent Correspondence," as Exhibit E-17. The

second response received was a Section 401 Water Quality Certification dated 21 July 1981, from the Ohio Environmental Protection Agency. A copy of this Section 401 Water Quality Certification is provided as Exhibit F-2c in Appendix F.

The Draft Reformulation Phase I General Design Memorandum and Draft Environmental Impact Statement, dated February 1981 (revised April 1981) for this project were distributed to the political leaders in the area and to various local, State, and Federal Agencies for their review and comment. Included in this review, was the District's tentative recommendation to implement Alternative Plan 3b (Modified Wetland/Parking Lot Harbor). (Note: Section IV of the Main Report includes a description of Plan 3b.) Loan copies of the report were also supplied to local libraries for review by the general public and various civic groups. Personal copies of the report were also made available to study participants free of charge. In addition, in accordance with National Environmental Policy Act (NEPA) procedures, the Draft Reformulation Phase I GDM and Draft EIS were filed with the U. S. Environmental Protection Agency (EPA) for a 45-day NEPA review. The Notice of Availability of the Draft EIS was published in the Federal Register by EPA on 22 May 1981. The official 45-day review period for the Draft EIS extended from 22 May 1981 to 15 July 1981.

Several letters of comment on the Draft Reformulation Phase I GDM and Draft EIS were received during the 45-day review period. These comment letters and the Buffalo District's responses are included in Appendix E, "Pertinent Correspondence," as Exhibits E-17 through E-21.

Coordination with the Ohio Department of Natural Resources

Several workshop meetings have been held with the Ohio Department of Natural Resources during the course of this study. At the initial workshop meeting on 15 December 1977, the Ohio Department of Natural Resources (ODNR), the local sponsor for this project, voiced its opposition to elimination of any parking area due to construction of the authorized small-boat harbor and requested that the harbor be moved westward of its original location to prevent reduction in the size of the parking area. ODNR also stated that they were opposed to acquiring any additional land outside the boundaries of the State Park for a small-boat harbor. Minutes of this workshop meeting are included as Exhibit F-1 in Appendix F, "Public Involvement."

The second workshop meeting was held on 18 January 1979. The purpose of this workshop meeting was to review the results of the studies conducted to date for the small-boat harbor study and to come to a decision regarding which of eight preliminary harbor layouts prepared by the Buffalo District were acceptable to ODNR. As a result of this workshop meeting, and as developed in greater detail in Section III of the Main Report, four preliminary harbor layouts were eliminated from further consideration. Minutes of this workshop meeting are included as Exhibit F-3 in Appendix F.

A third workshop meeting with ODNR and the USF&WLS was held on 29 May 1979 at the park. The purposes of this workshop were to discuss the preliminary layouts, designs, and costs that Buffalo District had prepared for the four alternative plans selected for further Stage 2 study with the principal agencies involved, and to obtain a consensus on the plan(s) to be carried into Stage 3 planning. ODNR stated that they needed additional time to study the construction and operating costs of each of the four alternatives before stating a preference. Therefore, no decision was made on the plans to be considered in Stage 3 at this workshop. See Exhibit F-4 of Appendix F for the summary minutes.

A fourth workshop meeting with ODNR and the USF&WLS was held on 26 June 1980 at Geneva State Park. The purposes of this meeting were to review the alternative harbor plans developed during Stage 2 planning and to reach agreement on the plan(s) that should be developed in detail during Stage 3. In addition, once agreement was reached on the recommended harbor plan, a conceptual mitigation plan would also be developed. As a result of this workshop meeting, and as developed in greater detail in Section IV of the Main Report, Alternative Plan 3b (Modified Wetland/Parking Lot Harbor) was selected for additional detailed study during Stage 3 planning. In addition, a conceptual mitigation plan, to offset environmental impacts of the harbor plan, was also developed. Minutes of this workshop meeting are included as Exhibit F-5, in Appendix F.

Coordination with the U.S. Fish and Wildlife Service

As stated above, the authorized project is located within the boundaries of an existing wetland area and its modification or elimination poses severe environmental concerns. At the initial workshop meeting for this study on 15 December 1977, the USF&WL Service stated that agency would oppose any project that destroys the wetland area but that they would consider mitigative measures. They reemphasized their concern over destruction of the existing wetland area in their preliminary "Planning Aid Letter" and final "Planning Aid Letter" dated 7 March 1978 and 15 May 1978, respectively, and recommended that alternative harbor sites be investigated. Copies of the preliminary and final "Planning Aid Letter" are included in the Plan of Study for this project.

Due to their concern over destruction of the existing wetland area, the USF&WL Service has been kept informed on the progress and results of this study through correspondence and verbal communications. They were provided with the eight preliminary harbor layouts prepared by the Buffalo District for the 18 January 1979 workshop meeting with ODNR and their comments and suggestions were requested. Where possible, their suggestions were incorporated into the four preliminary harbor layouts selected for further study. In addition, the USF&WL Service attended the 29 May 1979 agency workshop meeting and the 26 June 1980 workshop meeting. At the 29 May 1979 workshop meeting, they indicated: a preference for a marina location outside the wetlands (Cowles Creek area); opposition to the plan where the marina would be located in the wetlands; and a willingness to consider further two plans that would partially encroach into the wetlands (see Exhibit F-4 of Appendix F). Followup letters from the F&WLS (Exhibits E-11, and E-12, of Appendix E) modified their position to exclude further study of one of the plans that would partially encroach into the wetlands. At the 26 June 1980 workshop meeting, the F&WLS indicated that they would support Alternative Plan 3b as the preferred plan for additional detailed study (see Exhibit F-5 of Appendix F). They also provided input in developing a conceptual mitigation plan for this alternative. Details of this conceptual mitigation plan were then developed at the following workshop meeting on 27 June 1980 (see Exhibit F-6 of Appendix F).

Coordination with the USF&WLS was also accomplished regarding the potential impact of the proposed small-boat harbor project to Federally listed threatened or endangered species. By letter dated 9 October 1980 (Exhibit E-5 of Appendix E), the F&WLS responded that, although two species were listed as occurring within Ashtabula County, the impact to both species was anticipated to be minor and no additional coordination was required.

Model Study Coordination

As previously discussed, a hydraulic model study of the preferred harbor alternative is necessary to determine the most economical breakwater configuration which would provide a safe entrance and adequate protection for small craft in the mooring basin. Therefore, the Corps of Engineers Waterways Experiment Station (WES) was requested to perform a model study and provided the Buffalo District with an estimate of the cost and schedule to

conduct this study. Approval to conduct this study was then provided by the Office, Chief of Engineers by letter dated 7 May 1979. Correspondence relating to this model study is included as Exhibits E-4 and E-5 in the Stage 2 Report for this study.

Cultural Resource Coordination

By letter dated 23 October 1978, Buffalo District requested information on the cultural resources in the study area. This letter was sent to the Ohio Historic Preservation Office, the Regional Heritage Conservation and Recreation Service, Ann Arbor, MI, and the Advisory Council for Historic Preservation, Washington, DC. By letter dated 3 November 1978, the Ohio Historic Preservation Office stated that there was no known archaeological properties recorded in the study area but recommended that an archaeological survey be completed before any land alteration was undertaken. The Regional Heritage Conservation and Recreation Service replied by telephone call on 14 November 1978 and stated that no information on cultural resources in the study area was available. No reply was received from the Advisory Council for Historic Preservation. Copies of correspondence with these agencies are included in the Stage 2 Report for this study.

As previously discussed, in order to insure that all historical sites were identified prior to implementation of a small-boat harbor at Geneva State Park, a Cultural Resources Reconnaissance study was conducted in the early phase of Stage 3 planning. The results of this investigation were then documented in a draft report which was sent to the Ohio State Historic Preservation Office, the Regional Archeological Preservation Office, and the Heritage Conservation and Recreation Service for their review and comment. Following their review of the draft report, their comments were incorporated into the report and the report was then finalized. Copies of review comments received on the draft report are included in Exhibit G-1 (Cultural Resources Reconnaissance Survey, P/RA Research, Inc.).

Coordination with the United States Coast Guard

By letter dated 10 July 1980 (Exhibit E-6 in Appendix E), the Buffalo District requested that the U.S. Coast Guard review the alternative harbor plan selected for additional detailed study, define the required aids to navigation and estimate their construction and annual maintenance costs. The Coast Guard replied by letter dated 21 August 1980 (Exhibit E-7) that the proposed plan would require the establishment of a battery-operated light at the end of each breakwater, with an estimated construction cost of $35,000 each. Annual maintenance costs were estimated at $400 each.

Coordination with Local Boaters

To ensure that the alternative harbor plan selected for additional detailed study at the 26 June 1980 workshop meeting with ODNR, the USF&WLS, and the Buffalo District was compatible with the desires of local boaters, a workshop meeting was held with local boaters on 23 July 1980. The purposes of the meeting were to review the alternative harbor plan selected for additional detailed study and to determine specific channel width and depth requirements

for power boats and sailboats. Responses of local boats at this workshop were favorable to the selected plan. In addition, it was decided that the depth of the entrance channel to the small-boat harbor should be 8 feet below Low Water Datum (LWD) and the depth of the interior channels should be 6 feet below LWD. A channel width of 100 feet was also considered adequate for this harbor facility. Summary minutes of this workshop meeting are provided as Exhibit F-7 in Appendix F.

Coordination of the Mitigation Plan

As discussed in detail in Section IV of the Main Report, a mitigation plan was formulated to offset adverse environmental impacts of the harbor plan selected for additional detailed study. Components of this mitigation plan included development of additional wetlands in the pond to the west of the existing wetland area (to compensate for wetlands destroyed by the harbor plan) and installation of a water control structure at the mouth of the intermittent stream that runs through the wetlands in order to regulate water levels in the wetland area. Following completion of plan development for this mitigation plan, a copy of the mitigation plan was sent to the Corps Waterways Experiment Station (WES) - Dredging Operations Technical Support Section and Mr. Karl Bednarek, Director - Crane Creek Wildlife Experiment Station for their review and technical advice. WES replied by letter dated 21 October 1980 (Exhibit E-8 of Appendix E) that the mitigation plan appeared feasible and offered several comments that were taken into consideration by the District. No response was received from Mr. Karl Bednarek.

Coordination with Higher Corps Authority

The Stage 2 Report (July 1979) for this study was coordinated with and reviewed by North Central Division and Office, Chief of Engineers. Included in this review, was the District's interpretation of Executive Order 11990 (Protection of Wetlands) which precluded consideration of Alternative Plan No. 4 (Wetlands Harbor) because there were practicable alternatives (i.e. - Plans 2 and 3) to Plan 4. (Note: Section III of the Main Report includes a description of Plans 2, 3, and 4). As a result of this review, it was concluded that Alternative Plans 2 and 3 could be considered as practical alternatives, as defined by Executive Order 11990, if the wetlands lost because of the project (2.6 acres and 5.0 acres for Plans 2 and 3, respectively) could be replaced in-kind. Subsequent coordination with the U.S. Fish and Wildlife Service and an evaluation of the existing biological information by Buffalo District indicated that it would be feasible to replace any wetlands lost due to Alternative Plans 2 and 3. Therefore, Alternative Plans 2 and 3 were considered as practical alternatives to Plan 4.

THE REPORT

The overall organization of this report consists of a Main Report, a series of Technical Appendices (Appendices A through D), a Pertinent Correspondence Appendix (Appendix E), a Public Involvement Appendix (Appendix F), Reports of Others (Appendix G), and a Plate Appendix (Appendix H). The Main Report is written to give both the general and technical reader a clear understanding

of the study, the study results, and the key decisions and conclusions. The Main Report also includes the Final Environmental Impact Statement prepared for this project. The Technical Appendices provide additional detailed information on the design, costs and benefits of the alternatives studied. The Pertinent Correspondence Appendix includes copies of pertinent correspondence with organizations and individuals, significant in the development of this Phase I study. The Public Involvement Appendix includes minutes of the workshop meetings conducted during the course of this study. Reports of Others (Appendix G) includes the Cultural Resources Reconnaissance Report prepared by P/RA Research, Inc., the U. S. Fish and Wildlife Service's Four-Season Study Report, and the USF&WLS's Coordination Act Report. The Plate Appendix includes all the plates developed for the Main Report for easy reference.

OTHER ONGOING CORPS OF ENGINEERS INVESTIGATIONS IN THE AREA

There are presently two other ongoing Corps investigations within Geneva State Park: (1) a Shoreline Erosion Demonstration Project; and (2) a Section 103 study of Shoreline Erosion of Lake Erie at Geneva State Park, OH.

The purpose of the Shoreline Erosion Demonstration Project (authorized in Section 54 of the Water Resources Development Act of 1974 (PL 93-251)) is to develop, demonstrate, and disseminate information about low-cost means to prevent and control shoreline erosion.

The Demonstration Project at Geneva State Park consists of the construction of three different types of low-cost offshore breakwaters: sta-pods, gabions, and Z-walls. Specific information on the Shoreline Erosion Demonstration Project can be found in the Buffalo District "Geneva State Park, Ohio Shoreline Erosion Demonstration Project Preconstruction Report," dated February 1978. Construction of these offshore breakwaters was completed in the fall of 1978 and the monitoring program, conducted to assess the effectiveness of the different types of offshore breakwaters in preventing shoreline erosion, was completed in the fall of 1980. Currently, a final report is being prepared to document the results of this demonstration program.

As shown on Plate 5, the area selected for the demonstration project was in the Cowles Creek area which was also considered as an alternative site for the small-boat harbor project in Stage 2. However, because the monitoring phase of the demonstration project is completed, the demonstration project breakwaters could have been removed if the Cowles Creek harbor site was not eliminated from further consideration at the conclusion of Stage 2.

A Reconnaissance Report on Shoreline Erosion of Lake Erie at Geneva State Park considered the feasibility of constructing shoreline protective works at the publicly-owned recreational complex. The report was prepared by the Buffalo District in November 1977 under the authority of Section 103 of the 1962 Rivers and Harbors Act. The report recommended the construction of groins near the western end of the park and in the Cowles Creek area. Plates 6 and 7 show the recommended groin locations.

The groins recommended at the western end of the park would not interfere with any of the alternative harbor sites being investigated herein. However, the groins recommended in the Cowles Creek area would interfere with the harbor if the Cowles Creek area were to be selected for the harbor location. The Section 103 Reconnaissance Report indicated that due to Buffalo District funding and manpower restraints, the groins could not be constructed until the final years of the Shoreline Erosion Demonstration Project. Since the site location for the small-boat harbor will be determined well in advance of this timeframe, ample coordination of the projects will be possible.

In addition to the above-mentioned shoreline protection projects, the Ohio Department of Natural Resources has been involved in providing additional shoreline protective works at the State Park. These protective works include the installation of approximately 800 feet of steel sheet piling with gabions at the western end of the park and the construction of a concrete revetment and a small offshore breakwall in the vicinity of the bathhouse. The small-boat harbor study avoided disruption of these protective works and the breakwaters were designed to minimize any adverse effects they may have on these works.

SECTION II

PROBLEM IDENTIFICATION

The purpose of this section is to inform the reader of this report of the water and related resource problems and needs, or lack thereof, in the study area and for which this study seeks a solution. The section presents information on the existing physical, biological, and human environment in the study area; discusses the present demand for small-boat navigation and recreational fishing facilities; reviews the planning constraints under which this study was conducted; discusses the specific planning objectives of the study; and reviews the conditions that would exist if no Federal action was taken.

EXISTING CONDITIONS

The purpose of this subsection is to present the environmental setting without the project in order to assess impacts of the various alternatives on the existing environment. The information presented will provide a data base for impact assessment and evaluation purposes.

Physical Environment

(1) Location - Geneva State Park is located on the south shore of Lake Erie about 17 miles east of Fairport Harbor, OH, and 12 miles west of Ashtabula Harbor, OH, as shown on Plate 1. The project site is located between Wheeler Creek and Cowles Creek, and immediately east of a small unnamed creek which flows through a wetland area. The inland area consists of upland woods, swamp forest, herbaceous wetlands, and developed park facilities in the form of parking and picnic areas and associated roads and buildings. The lake shorelne, which varies in width from 0 to 100 feet, is generally straight, with a sand beach with several shoreline erosion protective works.

(2) Physiography - Topography - The Ohio landscape along Lake Erie is part of the Erie-Ontario Lowlands Province. Largely shaped by glacial activity which ended roughly 10,000 years ago, the province includes the flat, low-lying areas which border the southern shore of Lake Erie and extends approximately 2 to 50 miles inland where it is bordered on the south by the Appalachian Uplands Province. The lowlands rise gently to the east and south from an elevation of 570 feet above mean sea level at Lake Erie to about 700 to 1,000 feet above mean sea level along the Ashtabula Moraine which marks the southern limits of the province. Glacial deposition has left recessional moraines and shoreline deposits which modify the simple erosional topography. Land surfaces at the park rise abruptly forming bluffs 15-20 feet high near the shoreline.

(3) Climate - The climate of the Geneva-on-the-Lake area is defined as "humid continental" and is characterized by large diurnal and annual fluctuations in temperature. Temperature extremes recorded at the nearest national weather service station at Geneva, OH, range from a summertime maximum of 98°F to a winter minimum of -17°F. Monthly average temperatures

range from a low of 27°F during January to a high of 71°F during July. Some moderation of temperature extremes results from Geneva State Park's close proximity to Lake Erie.

Annual precipitation in the vicinity of the project area averages 39.07 inches with April being the wettest month (3.91 inches) and February the driest month (2.32 inches). Distribution of precipitation is quite even throughout the year.

Wind velocity is generally moderate with northwesterly and southwesterly prevailing winds.

(4) Geology - A thick sequence of sedimentary strata of Paleozoic age exists in the northeast region of Ohio and is extensively mantled by Pleistocene glaciolacustrine and glacial till deposits. Precambrian crystalline basement rocks underlying the Paleozoic strata are chiefly gneiss and granites. Outcrops of Precambrian rocks are absent in Ohio as this surface lies about 5,000 feet below sea level. The shallowest bedrock in the area is the Chagrin Shale of Upper Devonian age. This shale formation is on the order of 1,000 feet thick and dips gently to the southeast. The Chagrin Shale underlies the lake bottom near shore, but is usually not exposed along the shoreline or in bluff areas. In the offshore area, the bedrock surface is very close to the ground surface (from one-half foot to 4 feet below lake bottom).

Between Madison Township Park and Geneva-on-the-Lake, the bluffs are 10 to 12 feet high and composed almost entirely of silt and clay overlying the glacial till, the upper surface of which is just above lake level. Between Geneva-on-the-Lake and Walnut Beach Park, just west of Ashtabula Harbor, the bluffs gradually increase to a height of 30 to 50 feet and are composed almost entirely of glacial till. The general surficial sequence is till unconformably upon shale and overlain by glaciolacustrine silts. Glaciolacustrine sand and gravel deposits sometimes top the silt. The thickness and presence of each layer varies from location to location. On the average, approximately 25-30 percent of the material exposed in the bluffs is potential beach-building sediment. Lacustrine deposits exposed in the bluffs supply fine sand to beaches, while till supplies sand and coarser-sized material. The streams between Fairport and Ashtabula carry little sand to the lake. Their drowned mouths act as settling basins for all but the very finest sediments.

(5) Soils - Soils in the project area are somewhat varied and reflect the geologic background of the area, their position in relation to topographic, climatic, and vegetational factors, and the interaction of time working on these elements. The facts most responsible for differences in the soils at Geneva State Park are parent material, topography, and alteration of original soils by human disturbances. Six soil types are found in the vicinity of Geneva State Park. A soils map depicting soil types is shown on Plate 8 of Appendix H. The area surrounding the bathhouse, the parking lot, and borrow pits (ponds) is classified as Madeland (Ma in the Soil Conservation Service series classification). Madeland comprises approximately 54 percent of the area and represents the dominant soil type.

Conneaut silt loam (Ct) occupies 26 percent of the area, most of which is presently wooded. The Willette series (We) consists of mucky, black soil comprising 11 percent of the area. Holly silt loam (Hm), Platea silt loam (PsB), and Beaches (Be) occupy 4 percent, 3 percent, and 2 percent of the area, respectively. A brief description of the six soil types are as follows:

(a) Madeland (Ma) - Madeland consists of areas of earth fill, of borrow pits, and of areas where much of the soil surface is covered by streets, buildings, parking lots, or docks. In all of these areas, the original soils have been greatly altered.

(b) Willette muck (Wc) - The Willette series consists of black, mucky, level soils that are very poorly drained. These soils are formed in an accumulation of partly decomposed, saturated vegetative materials mixed with variable amounts of mineral material. They occupy low-lying bogs and swamps and are commonly adjacent to soils on flood plains.

(c) Conneaut silt loam (Ct) - The Conneaut series consists of deep, poorly drained, nearly level soils that formed partly in a silt loam mantle and partly in underlying silt loam glacial till. These soils occupy broad areas on the lake plain. These soils are classified as prime farmland soils within Ashtabula County.

(d) Holly silt loam (Hm) - The Holly series consists of a dark-colored, poorly drained soil formed in recent alluvium deposited by flooding streams. Most areas of Holly soil are long and narrow and are on flood plains along streams. These soils are classified as prime farmland soils in Ashtabula County.

(e) Platea silt loam, 2 to 6 percent slopes (PsB) - This series consists of loamy, nearly level to sloping soils that are somewhat poorly drained. These soils have a dense, compact layer, or fragipan, in the lower part of their subsoil. Platea soils formed in silt loam glacial till of Wisconsin age.

(6) Littoral Transport - The Lake Erie shoreline in the vicinity of the State park is composed of unconsolidated material, primarily sand with some gravel and cobblestones. The prevailing winds, which are significant in influencing coastal processes, approach the shore from the northwest, and the prevailing wave action is also from that direction. When waves reach the shallow region near shore, they break and energy is imparted onto the shore. The result of this energy transfer is a net movement of sediments along the shore in the direction opposite to that from which the waves approach the shore.

Predominant winds of high velocity are from the southwest through the west to the northwest and the northeast. Under the influence of this wind pattern, the prevailing and predominant littoral transport is from west to east, with temporary reversals in direction due to winds from the north and northeast. Accretion adjacent to shore structures confirms this analysis.

(7) Water Levels and Fluctuations - All depths mentioned, unless otherwise stated, are referred to Low Water Datum (LWD) for Lake Erie, which is 568.6 feet on International Great Lakes Datum - 1955 (IGLD-55) as measured above mean water level at Father Point, Quebec. Water stages at Geneva-on-the-Lake are equivalent to and dependent upon the water surface of Lake Erie, which varies from year to year, but is subject to a seasonal rise and fall, the highest prevailing during the summer months, and the lowest during the winter months.

(8) Biological Habitats and Species - This section presents a brief description of the biological habitats and species present in Geneva State Park that could be affected by a boat harbor plan. The information presented herein results from a four-season survey of the area conducted by the U.S. Fish and Wildlife Service during 1978 and 1979. 1/ The Fish and Wildlife Service surveyed the marsh/swamp area to the west of the Geneva State Park parking lot and the areas of Wheeler Creek and Cowles Creek.

The entire marsh/swamp complex at Geneva State Park can be separated into several different habitat types based upon the amount of standing or flowing water present and the typical vegetation types associated with the habitat types. Two large bodies of water, borrow pits (Ponds "A" and "B") were created when material excavated from the area in the early 1970's was used to construct the State Park parking lot. Both ponds are generally open water and are connected to the marsh by small, short channels. The west pit is about 4.2 acres in size and has a maximum depth of 7.5 feet. Steep slopes and exposed clay subsoil limit the growth of aquatic vegetation around its perimeter. The east pond is smaller, about 2.4 acres in size, and shallower with a maximum depth of 5.5 feet. A small island is present near the westerly shore of the pond and its perimeter supports a growth of Phragmites, cattails, rushes, and arrowhead. A hardwood forest of cottonwoods, aspens, ashes, and some willows partially borders both ponds. The marsh/swamp proper (see Plate 9 in Appendix H) consists of several different habitat types. These include wooded swamp, dominated by an overstory of dead trees; shrub swamp with dense stands of buttonbush and ash; deep marsh of spatterdock and cattails; shallow marsh of dense emergent growth and a wet meadow of willows, grasses, and sedges. Bordering the marsh/swamp habitats are upland habitat types consisting of oldfield with willows, cottonwoods, aspens, dogwoods, and sumac and areas of mowed grass in the parking lot area.

The variety of habitats present in the marsh/swamp complex provides excellent breeding, feeding, and resting areas for fish, birds, and mammals as well as invertebrates and reptiles and amphibians. The Fish and Wildlife Service collected 22 species of fish in the area. Typical pond species, such as golden shiner, emerald shiner, bullheads, carp, and five species of sunfish, dominated the fish community. Benthos were not sampled in detail, but a relative diverse community of isopods, amphipods, crayfish, damselfly larvae, midge larvae, and other species were identified. Midland painted turtles, snapping turtles, eastern garter snakes, and northern water snakes were all commonly observed in the marsh/swamp complex. A total of 86 species of birds were also observed in the area. The most common species were tree and barn

1/ U.S. Fish and Wildlife Service, Columbus Field Office, 3 April 1980. Four-Seasons Study, Geneva-on-the-Lake, Ashtabula County, OH. Exhibit G-2 of Appendix G.

swallows, and red-winged blackbirds. Waterfowl were also common in the area and breeding pairs of wood duck, mallard, and Canada goose were confirmed for the complex. The most common predacious mammal was the raccoon. Deer, muskrat, red fox, and other small mammals were also present. Beaver and mink were also present in the marsh/swamp complex although they were not directly observed.

The Cowles Creek area in the vicinity of the project area includes a main channel joining Lake Erie and two creek branches that meet roughly 800 feet from the mouth. The majority of the east bank of the creek is adjacent to a wooded picnic area and is steep banked and has sparse aquatic vegetation development. Along the north bank of the east branch is a wet area dominated by spatter-dock. The area between the branches is forested except at the downstream end, where grasses and rushes predominate. The west bank of the main channel and west branch has a fairly well-developed aquatic plant community including wet meadow, shallow marsh, and periodically inundated woodland. Between the pedestrian footbridge and the parking lot, immediately west of the inundated woodland area is a 1-acre portion of wet meadow believed to be the remains of a channel which once connected Cowles Creek and the marsh/swamp creek.

Wheeler Creek, near the west boundary of the State Park, is in an area which would not be impacted by any of the boat-harbor alternatives. It is more vegetated with aquatic plant species than is Cowles Creek. It includes sizeable shallow marsh and wet meadow areas adjacent to both creek banks except near the mouth where a mowed grass area borders the west bank.

A total of 34 fish species were noted to occur in both Wheeler and Cowles Creeks combined. The majority of the sportfishing in the park occurs at the creeks, with coho salmon and steelhead being the species sought.

The U.S. Fish and Wildlife Service biologists noted 56 bird species in the Cowles Creek area and 27 in the Wheeler Creek area, compared with 86 species in the marsh/swamp complex. The insectivorous swallows and martins were observed to be breeding in the vicinity of the creeks, as were certain other small birds, notably red-winged blackbird, song sparrow, and yellow warbler. The Cowles Creek area was noted as a breeding site for belted kingfisher, and wood ducks used the oak trees in this region as a food source.

For more detail regarding the biological resources of the project area, the reader should refer directly to the Fish and Wildlife Service report.

(9) Endangered and Threatened Species - Several plant and animal species, protected by the Federal Government (Endangered Species Act) and by the State of Ohio, have known ranges that encompass the Geneva-on-the-Lake area or have recently been sighted in the area. Coordination with the U.S. Fish and Wildlife Service 1/ indicates that two Federally Endangered Species

1/ Refer to U.S. Fish and Wildlife Service letter, dated 9 October 1980, (Exhibit E-5 of Appendix E).

occur in the Ashtabula County area. These species are the Indiana bat (*Moyotis sodalis*) and Bald eagle (*Haliaeetus leucocephalus*). Neither species has been recently sighted in the study area although Bald eagles probably migrate through the area at times. Three Ohio Endangered Species (one fish, one bird, and one plant) and two Ohio Threatened plants have recently been sighted in the study area. Table 1 gives a tabulation of information known about these species. Ohio Endangered Species are in danger of being extirpated from the State while Ohio Threatened Species are less rare, but still likely to become endangered in the near future.

Human Environment

(1) Land Use - Geneva and Geneva-on-the-Lake are primarily residential communities with many summer cottages. Geneva-on-the-Lake is also a summer resort area. Many small shops, restaurants, motels, and rented cottages are located along Ohio Route 531, east of the State Park. The villages and the park cater to a large volume of transient vacationers who generally remain in the area for 1 to 2 weeks. Additional persons visit the area on weekends and holidays.

Major land use in Ashtabula County remains agricultural-rural. In 1971, 92.4 percent of all land use was agricultural-rural; in 1977 it declined to 89.4 percent. Plate 10 depicts a generalized land use map for Ashtabula County (1977) provided by the Ashtabula County Planning Commission in a publication titled "Ashtabula County Land Use, 1977."

(2) Demography - According to 1970 U.S. Census data, the city of Geneva had a population of 6,449, while the village of Geneva-on-the-Lake had a population of 877. The 1970 population of Ashtabula County was 98,237, an increase of 5.6 percent since 1960. Ashtabula County has shown consistent population gains over the past three decades, achieving its highest historical population in 1970. However, its current growth rate is just slightly more than half the Ohio average of 9.8 percent, a trend influenced by a net outward migration of 3.5 percent, which is almost three times the State average. The age distribution and sex ratio in Ashtabula County are comparable to those of Ohio, with a slightly higher percentage of its population over 65 years of age (10.2 versus 9.4 percent). According to a 1972 report by the Ashtabula County Planning Commission, the future population of Ashtabula County is projected to be 111,743 in 1980, 126,826 in 1990, and 135,520 in the year 2000, a 41 percent net increase over the next three decades.

Ashtabula County has a small, non-white population of 2,818 or 2.9 percent of the total population. Approximately 16 percent of the county's population is of foreign stock, while Ohio as a whole has a lower proportion of foreign stock at 12.3 percent.

(3) Housing and Structures - As of 1970, housing units in Ashtaula County totaled 33,835. Of these, 23,250 were listed as owner-occupied, with a 1970 median value of $14,000. The city of Geneva had a total of 1,979 housing units as of 1970, of which 1,352 were occupied by their owners.

Table 1 - Endangered and Threatened Species Recently Verified for the Geneva-on-the-Lake Study Area

Species Common Name	Scientific Name	Status	Remarks
American brook lamprey	*Lampetra lamottei*	OE	Collected by local fishermen on Wheeler Creek (4/24/79) 1/
Sharp-shinned hawk	*Accipiter striatus*	OE	Fairly common throughout area but not as breeding pairs 1/
Inland beach pea	*Lathyrus maritimus*	OT	Found along beach zone in park and in the Wheeler Creek area in 1979 2/
Water-starwort	*Callitriche verna*	OT	Found in the wetland area at the State Park in 1979 2/
Leafy tussock sedge	*Carex aquatilis*	OE	Found near the mouth of Wheeler Creek in 1979 2/

Status: OE = Ohio Endangered
OT = Ohio Threatened

1/ Refer to U.S. Fish and Wildlife Service Four-Seasons Study Report, dated 4/3/80 (Exhibit G-2 in Appendix G).

2/ Information supplied by Ohio Department of Natural Resources, Division of Natural Areas and Preserves, Ohio Natural Heritage Program.

Median price asked for housing in Geneva in 1970 was a very low $9,400, indicating a depressed housing market in the city. Due to the small size of the village of Geneva-on-the-Lake, specific housing statistics are not readily available. Conversations with the village's Chamber of Commerce indicate that although much of the housing in the area is of relatively poor quality for use as year-round residences, housing is generally in short supply due to a large increase in population (estimated at about 50 percent) over the past 3 years. Many of these housing units were originally intended as primarily summer residences or cottages.

(4) Business and Industry - The city of Geneva, as of 1972, had 126 retail establishments with total sales in excess of $27,000,000. Of these, over half were listed as sole proprietorships. According to the Geneva City Manager's Office, the single largest employer in Geneva is the True Temper Corporation, which manufactures sporting goods and accessories and employs several hundred workers. Remaining businesses in the area are relatively small, employing less than 50 workers each.

Information supplied by the Chamber of Commerce in Geneva-on-the-Lake indicates that the major industry in that area is tourism, including cabin rental, boat and equipment sales and rentals, and related businesses.

(5) Employment and Income - As of 1970, employed persons 16 years old and over in Ashtabula County totaled 36,562, including 12,650 female employees. Employed persons classified as operatives comprised the single largest occupation group in the county, totaling 8,203, followed by craftsmen and foremen (6,223), clerical and kindred workers (4,645), service workers (3,772), professional and technical workers (3,680), managers and administrators (2,902), and sales workers (2,155).

As of 1969, median income for males 16 years and over with earnings was $8,150, while median income for females in the same cateogry was $3,388. Those employees classified as professional, managerial, and kindred workers in Ashtabula County had, as a group, the highest median income at $9,837, followed by craftsmen and foremen ($8,983), operatives ($7,718), and laborers ($5,722).

The unemployment rate in Ashtabula County, as of 1970, was approximately 4.0 percent, or just slightly higher than the 3.9 percent unemployment rate for the entire State of Ohio.

(6) Transportation - Geneva-on-the-Lake and Geneva State Park are readily accessible from the south by State Route 534, which joins U.S. Route 20 and Interstate Route 90 to the south, and from the east on State Route 531, which has connections with State Route 11 and U.S. Route 20 to the east. Interstate 90 and U.S. Route 20 both run generally east and west and have connections with major urban areas including Cleveland to the west and Erie and Buffalo to the east. State Route 11 is a divided highway which runs generally north and south and joins other major highways and the city of Youngstown to the south.

(7) Utilities - The Cleveland Electric Illuminating Company supplies electricity to both Geneva and Geneva-on-the-Lake, and the East Ohio Gas Company is responsible for natural gas distribution in both communities. In addition, both communities have their own self-contained sewage treatment plants.

Water service is supplied to both Geneva and Geneva-on-the-Lake by the Ohio Water Service Company. The company has one intake structure located in 4 to 10 feet of water about 1,250 feet from the shoreline, east of the State Park. The overall availability of groundwater in Ashtabula County is very limited. Yields are generally never greater than around 5 gpm, even though the county has at least 1,900 logged wells.

The Western Reserve Telephone Company provides local service to area residents, while the Ohio Bell System handles long distance telephone operations.

(8) Recreational Resources - Geneva State Park is located at the northwestern corner of Ashtabula County, approximately 44 miles east of Cleveland and 26 miles west of the Ohio-Pennsylvania border. The park is a State-owned property administered by the Ohio Department of Natural Resources (ODNR), Division of Parks and Recreation. The park has about 1-1/2 miles of shoreline along Lake Erie. In addition to the facilities within the park, there are several golf courses, camping areas, and other recreational areas located nearby. The park is easily accessible from Interstate 90 and State Route 534 through the town of Geneva and the village of Geneva-on-the-Lake.

The Ohio Department of Natural Resources has developed a master plan for development of Geneva State Park. This plan includes extensive campgrounds, a small-boat harbor, a nature center, hiking trails, and bathing and parking facilities, as shown on Plate 2, all of which will add considerably to the park's value as a prime recreational resource. The closest public recreational beaches to Geneva State Park are at Ashtabula, OH, which is located approximately 12 miles to the east, at Presque Isle Peninsula in Erie, PA, located about 44 miles to the east, and at Headlands State Park in Mentor, OH, which is approximately 18 miles to the west. According to the boating facilities inventory along the coast of Lakes Erie and Ontario and their connecting waterways conducted by MRI, there are approximately 800 boat slips available in the area surrounding Geneva-on-the-Lake. Of these, 250 are located at Conneaut, OH, which is approximately 20 miles to the east, and approximately 550 are located at Ashtabula, OH, and vicinity, 12 miles to the east; as shown on Plate 11.

Attendance figures furnished by ODNR indicate that peak attendance at Geneva State Park occurred in Fiscal Year 1976 with a total attendance of 213,116. Figures since 1973 show a dramatic decrease in numbers of recreators engaged in swimming activities, down from a high of 41,128 in 1973 to 4,632 in 1975. However, 1976 showed an equally dramatic increase in swimming recreators totaling 20,387, more than quadrupling the 1975 figure. It is postulated that the decrease in swimming recreators is a result of the loss of the beach area caused by high lake levels on Lake Erie since 1973.

(9) Cultural Resources - No cultural resources protected by Federal mandates that would be affected by the proposed Corps action exist in the project area. The latest published version of the National Register of Historic Places, and all subsequent revisions have been consulted. There are no registered properties, or properties listed as being eligible for inclusion thereon, that would be affected by this project. A Cultural Resources Reconnaissance concluded that no significant cultural remains exist within the project area (see Exhibit G-1 of Appendix G).

PROBLEMS, NEEDS, AND OPPORTUNITIES

Recreational Small-Boat Needs

In its present condition, Geneva State Park offers no recreational facilities for boaters who desire to use Lake Erie. The closest facilities are located in Ashtabula Harbor, OH, approximately 12 miles to the east and in Fairport Harbor, OH, approximately 17 miles to the west. However, the existing facilities for recreational boating at these two harbors are currently utilized to full capacity with long waiting lists for permanent dock space.

The Ohio Department of Natural Resources has stated that they consider development of a small-boat harbor facility at Geneva State Park imperative to promoting optimum use of the park and to satisfying the large-scale demand of prospective and existing small-boat owners in the northeast section of the State of Ohio. They have also stated that this project is one of the top priorities of their department and they have spent considerable time and effort in petitioning Congress to appropriate the necessary funding to initiate this Phase I GDM study.

At the initial public meeting for this study on 22 March 1978, local interests expressed their desires for a small-boat harbor at Geneva State Park and requested that construction of this project be undertaken at the earliest possible time. They stated that there is presently an unfulfilled demand for additional permanent mooring facilities in the area and for additional public launching facilities. They consider Geneva State Park as an ideal location for a small-boat harbor to satisfy this demand because of its quiet setting, away from the commercial shipping activities of the other harbors in the area. Local interests also stated that they consider a small-boat harbor at Geneva State Park a prerequisite to attracting tourists and travelers to their resort area and, thus, enhance the area economy.

As part of this Phase I planning effort, Buffalo District personnel conducted a regional boating demand analysis to forecast existing and future demand for permanent boat moorings and trailered-boat launching facilities in the Ashtabula County area. This demand forecast was developed by a multi-step process which analyzed various current and projected socioeconomic variables (such as income level, household size, leisure time, and population,) travel time and alternate site factors to arrive at peak-day participation rates for boating in Ashtabula County. These participation rates were projected to the year 2030 in 10-year intervals. The participation rates were then converted to number of boats based on a 2.5 persons per boat conversion rate. The number of boats that would require permanent moorings and the number of boats

that would be trailered was then determined by assuming that 90 percent of all boats under 16 feet in length would be trailered (the number of boats under 16 feet in length was determined based on the percentage of boats currently registered in the State of Ohio which are under 16 feet.) The final step was to determine the number of boats which would use Lake Erie facilities and what boats would use inland facilities based on the existing proportion of facilities in the county. A detailed description of this procedure is included in Appendix D, "Economic Evaluation."

The results of the regional boating demand analysis are presented in Tables 2 and 3. These tables do not include the effects of the proposed U. S. Steel plant at Conneaut, OH, since it is not known at this time whether or not this plant will be built. During Stage 2 planning, a second demand forecast was developed based on the assumption that the plant would be built. In general, this new demand forecast indicated greater demand for permanent moorings and peak-day launchings with the proposed plant when compared to conditions without the plant. However, for this Phase I study, the effects of the proposed steel plant were not considered.

The demand forecasts presented in Tables 2 and 3 must be compared to the existing supply in Ashtabula County along the Lake Erie shoreline. At the present time, there are approximately 800 permanent mooring spaces and 14 launch ramps with a peak-day capacity of 560 launchings in the area. As can be inferred from the demand forecasts, these facilities are currently used to capacity. The tables also indicate that an appreciable demand for additional boat launching facilities and permanent berths exists in the Ashtabula County area.

Public Safety

Hazards to small-boat navigation exist due to the absence of a harbor or natural shelter in the 29-mile reach of Lake Erie between Ashtabula and Fairport Harbor. Due to the rapid generation of heavy wave action on this relatively shallow lake, small boats cruising in this unprotected area may have too great a distance to travel to safety. This problem becomes more critical with each passing year as more and more recreational craft take to Lake Erie.

Public sentiment expressed at the initial public meeting for this study favored construction of a harbor-of-refuge at Geneva State Park. The Geneva-on-the-Lake Fire Department stated that they consider construction of a harbor-of-refuge essential to providing the required emergency facilities for their resort area. In addition, the Ohio Department of Natural Resources has stated that construction of a harbor-of-refuge at Geneva State Park would be a major step in completing Ohio's program to establish a harbor-of-refuge at least every 15 miles along the Lake Erie shoreline.

Recreational Fishing Needs

At the initial public meeting for this study, local interests expressed a need for additional recreational fishing facilities along Lake Erie. As part of this Phase I study, Buffalo District personnel, therefore, conducted a

Table 2 - Demand for Permanent Moorings on Lake Erie in Ashtabula County 1/ 2/

Year	Power Boats	Sail Boats	Total
1970	1,270	140	1,410
1980	1,520	170	1,690
1990	1,720	200	1,920
2000	1,890	230	2,120
2010	2,050	260	2,310
2020	2,160	290	2,450
2030	2,300	310	2,610

1/ Does not include the effects of the proposed U. S. Steel plant at Conneaut, OH.

2/ Demand based on 2.5 persons per boat conversion rate.

Table 3 - Demand for Peak-Day Trailered Boat Launchings on Lake Erie in Ashtabula County 1/ 2/

Year	Power Boats	Sail Boats	Total
1970	1,440	220	1,660
1980	1,730	280	2,010
1990	1,970	320	2,290
2000	2,140	370	2,510
2010	2,330	420	2,750
2020	2,460	450	2,910
2030	2,620	510	3,130

1/ Does not include the effects of the proposed U. S. Steel plant at Conneaut, OH.

2/ Demand based on 2.5 persons per boat conversion rate.

regional fishing demand analysis during Stage 2 planning. The same procedure used to estimate regional boating demand was also used to estimate regional fishing demand except that participation rates were developed for peak-day fishing activities instead of participation rates for boating. A description of this procedure is included in Appendix D, "Economic Evaluation" of the Stage 2 Report for this study. The results of this regional fishing demand analysis are presented in Table 4.

Based on the methodology presented in the 1975 Statewide Comprehensive Outdoor Recreation Plan (SCORP) for Ohio, the existing peak-day capacity in Ashtabula County along Lake Erie is 2,400 fishing activity days. As can be seen from Table 4, this significantly exceeds the demand determined during Stage 2 planning. Therefore, it appeared at the conclusion of Stage 2 planning that additional land-based fishing facilities were not warranted for the Geneva project.

Because of the apparent conflict between the results of the regional fishing demand analysis completed during Stage 2 and the need for additional recreational fishing facilities as expressed at the initial public meeting, additional coordination with local interests (USF&WLS, ODNR, and the Ashtabula County Game Warden) was accomplished during Stage 3 planning. This coordination indicated that, although the existing shoreline was not being used to capacity, the existing offshore breakwaters in the county were filled to capacity during peak days. The reason for this was because the offshore breakwaters offered the fishermen an opportunity to fish in an area where the more desirable fish species were likely to be found due to the following factors: 1) the breakwaters allowed the fishermen to fish in deeper water; and 2) the breakwaters are conductive to the growth of attached algae which in turn supports many species of small invertebrates, particularly crustaceans, which are an important food source for many of the more desirable sport fish. Thus, it appeared that the value of a fishing experience for breakwater fishing exceeded the value of a shoreline fishing experience. In addition, since the existing offshore breakwaters were filled to capacity during peak days, it also appeared that there was a need for additional breakwater fishing facilities in Ashtabula County.

During Stage 3 planning, user-day values were determined for a breakwater fishing experience and a shoreline fishing experience in order to estimate the total annual value of recreational fishing at Geneva State Park for with project conditions and without project conditions. The difference between these two values would then be the annual benefit for providing breakwater fishing facilities as an integral part of the small-boat harbor plan. User-day values were determined based on the point rating method as outlined in the Water Resources Council - Procedures for Evaluation of National Economic Development (NED) Benefits and Costs in Water Resources Planning, 14 December 1979. The results of this analysis are presented in Appendix D, "Economic Evaluation." The user-day values determined from this analysis are: $2.18 per day for general shoreline fishing and $8.12 per day for shoreline salmon fishing; and $2.55 per day for general breakwater fishing and $9.18 for salmon breakwater fishing.

Table 4 - Demand for Peak-Day Fishing Activity Days on Lake Erie in Ashtabula County1/

Year	Demand
1970	760
1980	930
1990	1,070
2000	1,200
2010	1,320
2020	1,430
2030	1,570

1/ Does not include the effects of the proposed U. S. Steel plant at Conneaut, OH.

Shoreline Erosion

As discussed previously, a Reconnaissance Report on Shoreline Erosion of Lake Erie at Geneva State Park identified a need for shoreline protective works at Geneva State Park due to shoreline erosion. Although this Phase I investigation did not consider solutions to this shoreline erosion problem, every effort was made to minimize the effects of the harbor alternatives on the shoreline processes. As explained in Section III of the Main Report, this included incorporating a sand bypass system into each alternative formulated. In addition, the model study will provide qualitative information on the effects the breakwaters will have on the littoral processes and, if appropriate, modifications to the breakwater system will be incorporated to minimize any adverse impacts caused by the project.

PLANNING CONSTRAINTS

During this Phase I study several planning constraints were identified which impacted on the formulation of alternative plans developed to satisfy the water-related needs of the study area. These planning constraints included the following: (1) environmental constraints; (2) site location; (3) top-of-rock; and (4) harbor capacity. These constraints are reviewed below.

Environmental Constraints

As stated previously, the authorized project is located within the boundaries of an existing wetland area and modification or elimination of the wetland poses severe environmental concerns. In addition, Executive Order 11990, issued 24 May 1977, has placed increased emphasis on preservation of wetlands. This Executive Order states that: ". . . Each agency shall provide leadership and shall take action to minimize the destruction, loss, or

degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands in carrying out the agency's responsibilities for . . . providing Federally undertaken, financed, or assisted construction and improvements . . . each agency shall avoid undertaking or providing assistance for new construction located in wetlands unless the head of the agency finds (1) that there is no practicable alternative to such construction, and (2) that the proposed action includes all practicable measures to minimize harm to wetlands which may result from such use. In making this finding, the head of the agency may take into account economic, environmental, and other pertinent factors . . ."

The U. S. Fish and Wildlife Service has expressed their concern over destruction or modification of the existing wetland area. At the initial workshop meeting for this study on 15 December 1977, they stated that agency would oppose any project that destroys the wetland area, but that they would consider mitigation measures. They reemphasized their concern over destruction of the existing wetland area in their preliminary and final "Planning Aid Letter" and during their review of the alternatives formulated for this Phase I study.

During the course of this Phase I study, every effort was made to eliminate or reduce the impacts of the formulated alternatives on the existing wetland area. As discussed in Section III of the Main Report (Formulation of Preliminary Plans), alternatives were formulated outside the wetland area in due regard to the other planning constraints as discussed below. In addition, when formulated alternatives impacted on a portion of the wetland area, every effort was made to minimize this impact.

For all plans that impacted on a portion of the wetland area suitable mitigation measures were considered to be an integral part of the plan. However, due to the lack of current biological information in the study area during Stage 2 planning, a specific mitigation plan could not be developed for preliminary plans considered during Stage 2. This biological information was available early in Stage 3, however, and was used in formulation of a mitigation plan for the small-boat harbor plan selected for additional detailed study. In addition, an Environmental Impact Statement was prepared which assessed the effectiveness of this mitigation plan in preserving the existing environment.

Site Location

At the initial workshop meeting for this study on 15 December 1977, the Ohio Department of Natural Resources, the local sponsor for the project, stated that they were opposed to acquiring any additional land outside the boundaries of the State Park for a small-boat harbor. They also stated that due to existing and future park development, the only area available for a small-boat harbor was between Cowles Creek and the wetland area. Therefore, with the exception of a possible mitigation site at Wheeler Creek, all alternatives formulated for this Phase I study were limited to the area between Cowles Creek and the wetland area at Geneva State Park.

ODNR also voiced its opposition to disruption of any existing park facilities such as the parking lot and the pedestrian footbridge crossing Cowles Creek and any interference with the access to the existing bathhouse due to construction of a small-boat harbor. It was not possible, however, to formulate a harbor alternative that did not impact on either the existing wetland area or the existing park facilities in the area identified by ODNR for the small-boat harbor site. Therefore, for this Phase I study, various alternatives were formulated that had varying degrees of impact on the wetland area and on the existing park facilities in order that a compromise solution would be identified which had the least environmental impact while avoiding major disruption to existing park facilities.

Top-of-Rock

The final location, size, and shape of a small-boat harbor at Geneva State Park will be highly dependent on the location of top-of-rock which is near the earth's surface in much of the area. The location of the authorized project was chosen to minimize the amount of rock excavation and consequently minimize the construction cost of the project. Rock probings indicated that the authorized project could be constructed with little or no rock excavation. Any alternative location to the authorized project location must also minimize the amount of rock excavation because of associated high construction costs (rock excavation cost approximately $21.00/cy and earth excavation cost approximately $4.00/cy) that could jeopardize the economic feasibility of a small-boat harbor at Geneva State Park.

As previously discussed, the Corps undertook a seismic survey of the study area through a contract with Warren George, Inc. of Jersey City, NJ, and a bathymetric survey of the offshore area by Buffalo District personnel to establish the top-of-rock profile in the study area (after about the 3-foot contour, top-of-rock elevation is the same as the depth of water.) The results of these studies are presented in Appendix A, "Geology, Soils and Construction Materials." In general, the investigations (geophysical survey with auger borings and bathymetric survey) showed that a trough exists in the bedrock that would allow a harbor to be constructed with minimal rock excavation. This trough runs generally east to west between Cowles Creek and the large pond in the wetland area (Pond "A") and passes through the north half of the existing parking lot. The investigations also indicated that there are two areas where the 8-foot contour (the required depth for the harbor entrance channel) dips in towards shore: (1) opposite Cowles Creek; and (2) opposite the drainage outlet into Lake Erie for the wetland area.

In order to avoid extensive rock excavation, the alternatives formulated for this study were located in areas where the seismic survey indicated low top-of-rock. In addition, the location of the entrance channels for the various alternatives were selected where the 8-foot contour dipped in towards shore.

Harbor Capacity

The authorized small-boat harbor at Geneva State Park would provide mooring space for approximately 400 boats. Due to the large-scale demand for

permanent mooring space in Ashtabula County, however, the possibility of increasing the size of the harbor was discussed with ODNR at the 18 January 1979 workshop meeting (minutes of this meeting are provided as Exhibit F-3 in Appendix F.) At this meeting ODNR stated that they wanted to limit the size of the small-boat harbor at Geneva State Park to 400 boats. Therefore, for the Stage 2 studies, the preliminary alternative harbor layouts were formulated to provide sufficient mooring area to accommodate 400 boats. By letter dated 17 July 1979 (see Exhibit E-13 of Appendix E), ODNR further indicated a preference for a 300 or 360-boat facility. Most recently, at the 26 June 1980 workshop meeting with ODNR and the USF&WLS (see Exhibit F-5 in Appendix F), ODNR stated a preference for a 360-boat harbor facility since this size facility would be more compatible with their overall master plan for the park. Therefore, the plan selected for additional detailed study (Stage 3 study) was formulated to provide sufficient mooring space for 360 boats.

The expected fleet mix for a 360-boat harbor facility at Geneva State Park is shown in Table 5. (Note: The expected fleet mix for a 400-boat harbor facility, used in developing preliminary alternative harbor layouts during Stage 2 planning, is provided in the Stage 2 report for this project.) This fleet mix was generated based on existing boating registration statistics in the State of Ohio modified to account for future competition for berths in the region. A detailed description of this procedure is provided in Appendix D, "Economic Evaluation." The expected fleet mix was used to size the required mooring area and new harbor facilities and to estimate the benefits that would accrue due to construction of a small-boat harbor.

Table 5 - Expected Fleet Mix at Geneva State Park[1/]

Type of Craft	Length (feet)	Number of Boats
Outboards	16	26
Outboards	16-25	12
Inboards	16-25	44
Cruisers	16-25	23
Cruisers	26-39	161
Cruisers	40-64	26
Sailboats	16	4
Sailboats	16-25	4
Auxiliary Sailboats	16-25	5
Auxiliary Sailboats	26-39	30
Auxiliary Sailboats	40-64	5
Transient Boats	-	20
Total		360

1/ Does not include the effects of the proposed U. S. Steel plant at Conneaut, OH.

NATIONAL OBJECTIVES

Current Federal policy, as developed by the President's Water Resources Council, requires that the alternative water and related resource plans be formulated in accordance with the national objectives of National Economic Development (NED) and Environmental Quality (EQ). Therefore, in accordance with the guidance established in Engineering Regulation 1105-2-200, Multiobjective Planning Framework," dated 13 July 1978, this study was consistent with the planning requirements of the Water Resources Council "Principles and Standards (P&S) and related policies. In accomplishing the study, equal consideration was given to the P&S objectives of NED and EQ described below:

National Economic Development (NED) - National Economic Development is achieved by increasing the value of the nation's output of goods and services and improving economic efficiency.

Environmental Quality (EQ) - Environmental Quality is achieved by the management, conservation, preservation, creation, restoration, or improvement of the quality of certain natural and cultural resources and ecological systems.

SPECIFIC PLANNING OBJECTIVES

Specific planning objectives are the National, State, and local water and related land resources management needs (opportunities and problems) specific to a study area that can be addressed to enhance National Economic Development and Environmental Quality. Based on a review of the directives established by the authorizing resolutions for a small-boat harbor and harbor-of-refuge at Geneva State Park, previous reports for the area, statements by individuals in the private sector, input from officials at many levels of government and an analysis of the problems and needs of the study area, as discussed previously, the specific planning objectives for the Geneva-on-the-Lake Small-Boat Harbor project that have been identified are as follows:

a. Appreciable recreational boating demand exists in the area which is presently unfulfilled due to a lack of adequate harbor facilities. Therefore, one objective of this study will be to provide a recreational harbor facility for shallow draft recreational craft which will also enhance the development of the existing State park at Geneva-on-the-Lake.

b. Hazards to small-boat navigation exist due to the absence of a harbor or natural shelter in the 29-mile reach of Lake Erie between Ashtabula Harbor and Fairport Harbor. The need for a harbor-of-refuge facility becomes more critical with each passing year as more and more recreational craft take to Lake Erie. Therefore, the second objective of this study will be to provide a harbor-of-refuge for light-draft recreational craft between these two Federally improved deep-draft harbors.

c. Due to the State Park's location near good recreational fishing areas of Lake Erie, local interests state that appreciable recreational fishing needs exist in the area. Therefore, another objective of this study will be to incorporate, if justified, such facilities in the project as are necessary to aid in meeting the land-based recreational fishing needs of the area. This need could be met, for example, by providing access onto any breakwaters that may be constructed for the small-boat harbor.

d. Any development that would modify the existing wetland area within the State Park poses severe environmental concerns. Therefore, one objective of this study will be to minimize or eliminate any adverse environmental impacts resulting from this project on the wetland area. This objective could be met, for example, by relocating the authorized harbor project, relocating the existing wetland area, or increasing the quality of the remaining wetland area if a portion of the wetland area is destroyed.

e. Any development that disrupts existing park facilities poses severe concerns to the State of Ohio. Therefore, one objective of this study will be to minimize or eliminate any adverse impact on existing park facilities.

This objective could be met, for example, by relocating the authorized harbor project or relocating the existing park facilities.

f. The maintenance of national strength and satisfactory levels of living will be achieved by increased national income and productivity. Therefore, one objective of this study will be to maintain or improve the economic status of the area. This objective will be met by constructing a harbor for which the benefits derived from the project exceed the project costs.

g. Previous Corps reports have indicated the need for shoreline protective works to reduce shoreline erosion at Geneva State Park. Therefore, another objective of this study will be to incorporate such facilities as are required to make the harbor project compatible with the existing and future shoreline protective works at the State Park.

CONDITIONS IF NO FEDERAL ACTION TAKEN (WITHOUT PROJECT CONDITIONS)

In any formulation there is always the basic question of "is there a justified need for change." Therefore, the conditions that would exist if no Federal action were taken was investigated for this Phase I study. Besides answering the basic question, these conditions also provided a common basis for comparing alternative plans of improvement as discussed in Section III of the Main Report.

As a result of no action, there would be no recreational small-boat harbor facilities for local craft or a harbor-of-refuge for transient boats at Geneva State Park and vicinity since no other public agency or private developer has indicated that they would be willing or financially able to provide the necessary improvements. Therefore, the existing and future large-scale demand for permanent mooring space and additional launching facilities in the area would not be fulfilled. In addition, the potential for damage to transient boats and loss of lives will continue to be present in the area and will increase in time as more and more boaters take to Lake Erie. The local resort economy will also be thwarted since fewer tourists will be attracted to the area and the required supportive facilities such as motels, restaurants, marine supplies stores, entertainment, etc., will not be required. No development would also not aid in meeting the demand expressed by local interests for additional recreational fishing facilities in the area since the breakwater structures would not be built. In addition, the existing State Park would not realize its full investment value since it would not be used to its full potential due to a lack of boating facilities.

If no Federal action were taken, the existing environment (including the wetland area) would not be disturbed. It is also quite possible that, in the absence of a small-boat harbor, the value of the wetlands would increase as wildlife species, which are sensitive to disturbances by man, inhabit the area. In addition, there would be no disturbance of the other existing and planned park development or the nearshore littoral processes.

SECTION III

FORMULATION OF PRELIMINARY PLANS

The primary purpose of this section is to provide a summary of the Stage 2 planning effort conducted for this Phase I study. The section provides: a brief review of the alternatives investigated during the survey study; subsequent events that necessitated reformulation of the authorized plan of improvement; the formulation methodology used during Stage 2 planning; and a discussion on the development and assessment of preliminary alternative plans. The section then concludes with a discussion on plans of others.

PLAN FORMULATION RATIONALE

Alternatives Considered in the Survey Study

The survey study, as reported in House Document 91-402, considered one basic plan of improvement for meeting the recreational boating needs at Geneva-on-the-Lake. This plan, shown on Plate 3 of Appendix H, is described in Section I, preceding. Although minor variations of the recommended plan were considered for the survey report, no other alternative plans were evaluated. The authorized plan would provide a marina capacity for 400 permanent-based boats and a ramp for launching trailer-drawn boats.

Need for Reformulation of Alternatives (Reformulation Phase I General Design Memorandum)

The need for reformulating the authorized project is discussed in detail in Section I. In summary, post-survey physical changes at the project site (such as construction of a parking lot and expansion of an existing wetland area resulting from the parking lot construction) and legislative and executive actions that emphasize preservation of wetlands and the preservation and enhancement of the natural and human environment, led to the conclusion that reformulation of the authorized project was required. Approval to conduct a Reformulation Phase I General Design Memorandum was provided on 8 February 1978 (See Exhibit B-12 of the Plan of Study).

Stage 2 Reformulation

The objective of the Stage 2 investigation was to identify the best general plan(s) for satisfying the recreational boating needs at Geneva State Park based on physical constraints, the desires and preferences of local interests for recreational boating, and consistent with sound engineering, economic and environmental principles. In this process, an iterative procedure that provided for increased levels of refinement in design and critique and evaluation by the principal study participants (i.e. - Corps of Engineers; Ohio Department of Natural Resources; and U.S. Fish and Wildlife Service) was used to narrow the range of alternatives to carry forward into Stage 3 planning (Development of Detailed Plans). The procedure also allowed for review and comments by the general public at informal meetings, workshops, and through written communications.

Investigation of other water resources problems and needs, such as other types of recreation, water quality, sedimentation, erosion and/or flooding, was limited to a level of refinement necessary to adequately assess potential impacts of each on recreational boating and vice versa. Of particular importance at Geneva State Park is shoreline erosion. Section I of the Main Report discusses the Shoreline Erosion Demonstration Project and a Section 103 Shoreline Erosion Study at Geneva State Park.

GENERAL FORMULATION AND EVALUATION CRITERIA

Federal policy on multiobjective planning, derived from both legislative and executive authorities, establishes and defines the national objectives for water resource planning, specifies the range of impacts that must be assessed, and sets forth the conditions and criteria which must be applied when evaluating plans. Plans must be formulated to meet the needs of the area with due regard to benefits and costs, both tangible and intangible, and effects on the ecology and social well-being of the community.

The formulation of a plan, including the screening of alternatives, must of necessity be within the context of an appropriate framework and set of criteria. The planning framework is established in the Water Resource Council's "Principles and Standards for Planning Water and Related Land Resources," which requires the systematic preparation and evaluation of alternative solutions to problems, under the objectives of National Economic Development (NED) and Environmental Quality (EQ). The process also requires that the impacts of a proposed action be measured and the results displayed or accounted for in terms of contributions to four accounts: NED, EQ, Regional Development (RD), and Social Well-Being (SWB). The formulation process must be conducted without bias as to structural and nonstructural measures. (Note: Subsequent to completion of Stage 2 studies, revisions to the Principles and Standards (as set forth in the Water Resources Council - Principles and Standards for Water and Related Land Resources Planning - Level C; Final Rule, 29 September 1980) revised the four accounts to include: NED, EQ, Regional Economic Development (RED), and Other Social Effects (OSE). These new accounts will be used in Section V of the Main Report to measure the impacts of the alternative plans carried forward into Stage 3 planning.)

Within the structure of the overall planning framework, other more specific criteria relative to general policies, technical engineering, economic principles, social and environmental values and local conditions must be established. These specific criteria, used during Stage 2 planning and noted as "Technical," "Economic," and "Socio-economic and Environmental" are listed below. Changes to these criteria during Stage 3 planning are discussed in Section IV of the Main Report.

Technical Criteria

a. Design wave and lake level should be based on the recreational boating season which is assumed to extend from April to November on Lake Erie.

b. A coincident 200-year design frequency, using the 20-year recurrence significant deep water wave height in combination with the 10-year lake level, should be used for design of structures.

c. Overtopping of protective works for the design condition would be permitted to the extent that the residual interior wave shall be limited to a height consistent with safe and efficient operation of the marina facility.

d. Final design of the selected plan will be based on a model study which is presently being performed by the Waterways Experiment Station.

e. A sand bypass system will be incorporated into the project to compensate for down-drift loss of beach-building material caused by the harbor structures.

Economic Criteria

a. Tangible benefits should exceed project economic costs.

b. Each separable unit of improvement or purpose should provide benefits at least equal to its cost unless justifiable on a noneconomic basis.

c. Each plan, as ultimately formulated, should provide the maximum net benefits possible within the formulation framework.

d. The costs for alternative plans of development should be based on preliminary layouts, estimates of quantities, and October 1980 prices. (Note: The original cost estimates for Stage 2 plans were based on May 1979 price levels. However, for consistency with Stage 3 plans, which are based on October 1980 price levels, the original estimates have been updated to October 1980 price levels by Engineering News Record's "Construction Cost Index.")

e. The benefits and costs should be in comparable economic terms to the fullest extent possible.

f. A 50-year economic life and 7-3/8 percent interest rate are used for the economic evaluation. (Note: The original economic evaluation of Stage 2 plans was based on an interest rate of 6-7/8 percent. However, for consistency with Stage 3 plans, which are evaluated using an interest rate of 7-3/8 percent, the interest rate was changed to 7-3/8 percent.)

g. The base case for comparison of alternatives plans is the "do-nothing" (no-action) plan.

Socio-economic and Environmental Criteria

a. The criteria for socio-economic and environmental consideration in water resource planning are prescribed by the National Environmental Policy Act of 1969 (PL 91-190) and Section 122 of the River and Harbor Act of 1970, (PL 91-611). These criteria prescribe that all significant adverse and beneficial economic, social, and environmental effects of planned developments be

considered and evaluated during plan formulation. In addition, Executive Order 11990 dated 24 May 1977, directs that each agency shall provide leadership and take action to minimize the destruction, loss or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands.

Design and Other Considerations for Harbor and Marina Layout

Channels

a. Depth of Entrance Channel

1. All-weather Harbor: 8 feet below Low Water Datum (El. 568.6 on IGLD-1955)

2. Fair-weather Harbor: 6 feet below LWD.

b. Depth of Interior Channels: 6 feet below LWD

c. Channel widths: Minimum width of 100 feet for entrance, and interior channels.

Marina Requirements

a. For design purposes, it was assumed that approximately 1,000 square feet of surface area would be required per dockage space. This includes the area needed for the maneuvering area and access channels outside the Federal channels.

b. For Stage 2 analysis it was assumed that the marina should have a 400-slip capacity.

Harbor Location

a. Locate the harbor entrance and marina to take advantage of areas where bedrock is relatively deep, thereby minimizing expensive rock excavation.

Support Facilities

a. For Stage 2, assume that two launching ramps and a public landing with service facilities will be provided.

Wave Requirements

a. All-Weather Harbor: For the design wave condition, breakwaters and channels will be designed to limit overtopping such that waves in the entrance channel will be limited to 3 feet and in the mooring area to 1 foot during storms. Theoretical wave heights will be validated in a model study to be initiated in Stage 3 of the Phase I and completed during preparation of the Phase II General Design Memorandum.

b. Fair-Weather Harbor: Protective works shall be designed to prevent shoaling in the entrance channel and limit overtopping by waves up to 3 feet in height.

Slope Protection

a. Vertical Walls - A reinforced concrete "L" wall was assumed for costing purposes.

b. Slopes - Side slopes of 1V:3H were used, and riprap protection would be provided from -8 or -6 feet LWD to either +6 or +8 feet LWD, as appropriate.

Excavated Material Disposal

a. For this study, it was assumed that excavated material would be placed in the undeveloped camping area at the west end of the park (see Figure C-1 in Appendix C).

b. Cost estimates are based on trucking to the disposal site. A sufficient amount of contingency and cost is included in the estimate for landscaping and reseeding the area.

Mitigation

a. Disruption or Loss of Wetlands - There was insufficient environmental data during Stage 2 to determine the need for mitigation or the type of mitigation that might be required. Therefore, plans or costs for mitigation were not included in the estimates for the Stage 2 report. Suitable mitigation measures were formulated, however, for plans developed in detail during Stage 3.

Cost-Sharing

a. General Navigation Features - First costs for general navigation features such as breakwaters and entrance and interior access channels will be cost-shared 50 percent Federal and 50 percent non-Federal. Annual maintenance costs, including sand bypassing, and aids to navigation are 100 percent Federal.

b. Recreational Breakwater Fishing - First costs would be shared 50 percent Federal and 50 percent non-Federal, and annual operation and maintenance costs would be 100 percent non-Federal.

c. Support Facilities - Support facilities such as excavation for dockage and access areas, dock construction, construction of service facilities and launching ramps are 100 percent non-Federal. These costs are considered to be self-liquidating, and, therefore, are not included in determination of the economic viability of the plan.

DEVELOPMENT OF ALTERNATIVE PLANS (Possible Solutions)

General

Within the prescribed planning framework and established criteria, possible solutions were identified and evaluated in a three-stage iterative process to address the needs of the study area and the overall planning objectives. Each stage included the four functional planning tasks of problem identification, formulation of alternatives, impact assessment and evaluation. Each stage contained essentially the same sequence of tasks but emphasis shifted as the process proceeded.

This section of the Main Report presents the results of the Stage 2 evaluation. The level of study performed was consistent with the Stage 2 objective of evaluating a broad range of possible solutions and identifying the best general plan (or plans) for satisfying the recreational boating needs at Geneva State Park. Section IV of the Main Report will present the results of the Stage 3 evaluation.

Geneva State Park is a multi-use recreational complex that provides, or will provide, opportunities for picnicking, camping, swimming and recreational boating. The primary water resources need for which a solution is sought under this authority is provision of facilities for recreational navigation. As possible solutions to addressing this primary need, an array of ten structural solutions and one nonstructural solution, in addition to the "no-action" option, was initially identified. The first iteration of possible solutions is discussed below. Through the process of assessment and evaluation of these initial concepts in terms of their contributions to the planning objectives and accounts, five options (including no-action) were selected for further assessment and evaluation. These five intermediate alternatives are discussed in the following paragraph of this section - "Assessment and Evaluation of Preliminary Plans."

Initial Iteration of Alternatives

As the first step, an orientation workshop was held in Columbus, OH, on 15 December 1977 (See Exhibit F-1 of Appendix F) to discuss potential problems with providing small-boat facilities at Geneva State Park and to obtain input on possible alternatives to be considered. Representatives of Buffalo District, U.S. Fish and Wildlife Service and the Ohio Department of Natural Resources attended. Constraints to project development, such as high bedrock at the site, an existing wetland, and existing and planned park facilities (parking lot, bathhouse, swimming beaches, etc.) were identified and discussed. The Ohio Department of Natural Resources indicated that an alternate site to Geneva State Park would not be acceptable. Therefore, no further consideration was given to evaluating harbor sites outside Geneva State Park.

For this initial iteration, two different levels of harbor intent were considered. These levels were:

a. An all-weather harbor and harbor-of-refuge with sufficient capacity to provide for 400 slips.

b. A fair-weather harbor that would provide for about 100 slips.

Based on the input from the 15 December 1977 workshop and physical constraints at the Park, conceptual layouts for eight structural alternatives were prepared. These conceptual alternatives, along with other considered alternatives, are identified below. Additional details on these alternatives are provided in the Stage 2 Report for this project.

Alternative 1 - All-Weather Harbor at Cowles Creek (400 slips)
Alternative 2 - All-Weather Offshore/Onshore Harbor (400 slips)
Alternative 3 - All-Weather Wetland/Parking Lot Harbor (400 slips)
Alternative 4 - All-Weather Wetland Harbor (400 slips)
Alternative 5 - Fair-Weather Harbor at Cowles Creek (100 slips)
Alternative 6 - Fair-Weather Wetland/Parking Lot Harbor (100 slips)
Alternative 7 - All-Weather Offshore Harbor (400 slips and 2,500 feet of breakwater)
Alternative 8 - All-Weather Offshore Harbor (400 slips and 2,200 feet of breakwater)
Alternative 9 - Do-Nothing (no-action)
Alternative 10- Nonstructural Dry Storage Plan
Alternative 11- Alternate Site to Geneva State Park
Alternative 12- All-Weather Entrance with Dry Storage at Geneva State Park

Critique of First Iteration of Alternatives

A meeting was held with the Ohio Department of Natural Resources (ODNR) on 18 January 1979 (See Exhibit F-3 of Appendix F for minutes) to discuss the conceptual alternatives that had been prepared (Alternatives 1 through 8) and to obtain ODNR's views on which harbor alternatives were acceptable for further study. Based on consideration of ODNR's position and because they would not satisfy any of the projected recreational boating demand for permanently-based craft in the area nor would they meet the planning objective for a harbor-of-refuge, the fair-weather harbors (Alternatives 5 and 6) were eliminated from further consideration. Alternatives 7 and 8 were also rejected because they would have a much higher cost than other alternative all-weather plans. The nonstructural dry storage plan (Alternative 10) was rejected since it would not meet the planning objective for a harbor-of-refuge. This consideration is critical on Lake Erie because its shallow depth and long fetch quickly produce rough seas when subjected to sudden, relatively moderate winds from the west-southwest through east-northeast. Alternative 11 was also rejected because ODNR desires to further develop Geneva State Park as a multi-use recreational facility to include small-boat recreation and has no interest in purchasing additional lands in the area for this purpose. Alternative 12 was rejected by ODNR in subsequent discussions

because of significant operations problems experienced at an existing dry-storage facility elsewhere in the State. Since ODNR would not support dry-storage, no further consideration was given to Alternative 12. Although there were certain reservations regarding the viability of some of the remaining alternatives, it was decided to further evaluate structural Alternatives 1 through 4 and to carry forward the "Do-Nothing" alternative.

ASSESSMENT AND EVALUATION OF PRELIMINARY PLANS

General

The initial evaluation of possible conceptual solutions indicated that nonstructural measures would not meet the objective of providing safe opportunities for small-boat recreation in the study area. Similarly, a facility that would provide a fair-weather harbor was unacceptable because it would not meet the basic need for a refuge harbor for either locally based or transient craft in this relatively long reach of shoreline where few such facilities exist. In view of the planning objectives, and a cursury evaluation of accounts, and the related technical, economic, and socioeconomic criteria, an all-weather artificial harbor located onshore or onshore/offshore was considered to have the greatest promise for providing a solution to the recreational boating need in the study area.

This paragraph provides a summary of the engineering design, economic evaluation and environmental assessment of the four preliminary alternative structural plans that an initial screening of a wide range of possible solutions indicated had the greatest potential for meeting the planning objective of providing all-weather small-boat facilities at Geneva State Park. These four preliminary alternatives were:

Alternative Plan 1 - All-Weather Harbor at Cowles Creek (400 slips)
Alternative Plan 2 - All-Weather Offshore/Onshore Harbor (400 slips)
Alternative Plan 3 - All-Weather Wetland/Parking Lot Harbor (400 slips)
Alternative Plan 4 - All-Weather Wetland Harbor (400 slips)

In addition, the basis of comparison for the above structural plans was:

Alternative Plan 5 - No-Action (Do-Nothing) Plan

(Note: The Stage 2 Report for this project provides additional details on the engineering and economic analyses associated with the four structural alternatives for which preliminary designs were prepared.)

Standard Features of Preliminary Plans

(1) Sand Bypass System - Predominent littoral drift at Geneva State Park is from west to east. To prevent starvation of the down-drift shoreline, a 6-inch sand bypass pipe was placed beneath the entrance channel for all preliminary alternative plans. Sand that accretes to the west of the harbor structure would periodically be pumped to the east for down-drift nourishment.

(2) Entrance Channels - For Stage 2 design, the entrance channel for all preliminary alternatives was 8 feet below Low Water Datum (LWD=568.6 IGLD-1955) and 100 feet wide. These dimensions were selected to provide safe navigation for the projected fleet and to provide for two-way boat traffic at the entrance. Protective works would be provided to limit the wave height in the entrance channel to 3 feet for the design condition.

(3) Interior Channels - The interior access channels would be excavated to the 6-foot depth (below Low Water Datum) and would be a minimum of 100 feet in width. Wave heights would be limited to 1 foot.

(4) Mooring Areas and Service Facilities - As previously stated, the mooring areas were located to minimize costly rock excavation. For comparative cost estimating purposes, a standard depth of 6 feet below LWD was used for all mooring areas although this depth may be conservative particularly for any portion of the mooring area restricted to small craft with a static draft of less than 2 feet. In addition, using LWD as the reference plane may be conservative since the mean level of Lake Erie is nearly 2 feet above LWD and the monthly mean stage for the height of the boating season varies between one-half foot and 1 foot above LWD 95 percent of the time. However, because construction of the mooring area is a non-Federal responsibility and its cost is not included in the economic evaluation of the project, further refinement of the depth of the mooring basin was not required.

Sideslopes of IV:3H were used at the periphery of the mooring areas, where practical, to attenuate wave reflection and surging. Sideslopes would be riprapped, where necessary, to prevent erosion and sloughing of the banks and to further dissipate internal wave energy.

A public dock with appurtenant public service facilities such as fuel and pump-out stations, available to all on an equal basis, was incorporated into each alternative plan.

Although the costs for the marina and appurtenant features of the marina are considered to be self-liquidating and, therefore, are not included in the evaluation of economic efficiency of the project, preliminary estimates of quantities and costs were prepared and are presented herein. These costs were used by the sponsoring agency in its decision on plan selection.

Pertinent engineering, economic, environmental, and related data for each preliminary alternative plan follows.

Alternative Plan 1 - Cowles Creek

(1) Description of Plan 1 - Plan 1 would provide an all-weather harbor with a 400-slip capacity located inland near the mouth of Cowles Creek. In selecting Cowles Creek, the concept was to locate the marina outside of the wetland area. The Cowles Creek area provides the only apparent location in the park of sufficient size to accommodate a 400-boat marina without excessive rock and/or earth excavation. The layout and project features for Plan 1 are shown on Plate 12 of Appendix H.

The harbor entrance would be located immediately offshore from Cowles Creek to take advantage of the rock trough, thus, minimizing the amount of rock excavation. The entrance would be protected by a modified arrowhead rubble-mound breakwater system. Both arms of the arrowhead would be shore-connected to prevent shoaling of the navigation channel, to prevent adverse wave conditions in the harbor, and to provide access for fishing from the west breakwater. A short interior breakwater would be required to further reduce the transmitted wave into the mooring area to 1 foot. In addition, a 6-inch sand bypass pipe would be placed between the arms of the arrowhead to prevent starvation of the down-drift shoreline. Design computations for these features of Plan 1 are presented in Appendix B of the Stage 2 Report.

The location of the marina facilities were selected to minimize rock excavation. Consequently, a 2.5-acre site at the mouth of Cowles Creek, with a capacity for 100 slips and a 7.4-acre site in the existing parking lot (300-slip capacity), were identified for the mooring basins. The interior channel to the mooring basins would be 100 feet wide to the west and 130 feet wide to the east because of probable heavy traffic from the north and south basins and the launching ramps. A vertical reinforced concrete wall would be constructed along the north and west limits of the interior channel to minimize loss of land in the vicinity of the existing bathhouse and to provide dockage for craft being serviced. An existing footbridge near the outlet of Cowles Creek would be relocated to the south to provide access between Beaches A and B.

An 8-foot deep sediment trap with a capacity of 1,500 to 2,000 cubic yards would be excavated in Cowles Creek immediately upstream of the northerly mooring area. The purpose of this trap would be to collect Cowles Creek sediment, thereby reducing maintenance dredging within the interior channel and mooring basin.

(2) Cost Estimate for Plan 1 - The detailed cost estimate for Plan 1 is presented in Table C2 of Appendix C. The breakdown of the cost for lands and damages is shown in Table C1 of Appendix C, and the annual charges are summarized in Table C7.

Tables 6 and 7, following, summarize the estimated project costs and annual charges and provide a breakdown of the Federal and non-Federal share of these costs for Plan 1. From these tabulations, it is seen that the total project cost is $5,516,000 (Table 6), the total investment cost, including interest

Table 6 - Estimate of Total Project Cost for Alternative Plan 1 and Federal and Non-Federal Share (October 1980 Price Levels)

Item	Amount	Total
	$	$
TOTAL PROJECT COSTS:		
1. Relocations	14,000 1/	
2. Channels	1,750,000	
3. Breakwaters	1,684,000	
4. Recreational Facilities	119,000 2/	
5. Aids to Navigation	28,000 3/	
6. Lands and Damages	628,000	
7. Footbridge and Sidewalk	140,000 3/	
8. Engineering and Design	845,000 4/	
9. Supervision and Administration	308,000	
Total Project Cost		5,516,000 5/
FEDERAL SHARE:		
50 Percent of Items 1, 2, 3, 4, 8, and 9	2,360,000	
Aids to Navigation (U. S. Coast Guard)	28,000	
Total Federal Share of Project Cost		2,388,000 5/
NON-FEDERAL SHARE:		
Cash Contribution (50 Percent of Items 1, 2, 3, 4, 8, and 9)	2,360,000	
Lands and Damages	628,000	
Footbridge and Sidewalks	140,000	
Total Non-Federal Share of Project Cost		3,128,000 5/ 6/

Source: Stage 2 Report, updated to October 1980 price levels.

1/ For removing an existing footbridge across Cowles Creek.

2/ To provide walkway and handrail on west breakwater for breakwater fishing.

3/ Cost includes necessary Engineering and Design and Supervision and Administration.

4/ Includes $124,000 for hydraulic model study.

5/ Cost estimate does not include costs for mitigation of adverse environmental impacts that may be required for Plan 1. Costs for mitigation will be included in Stage 3, as appropriate.

6/ Does not include costs for self-liquidating features of the project, such as dredging of mooring areas and construction of docks, launching ramps and public service facilities. The estimated non-Federal cost for these self-liquidating features is $4,800,000 (October 1980 price levels).

Table 7 - Estimated Investment Cost and Annual Charges for Alternative Plan 1 (October 1980 Price Levels) 1/

Item	Navigation	Recreation	Total
	$	$	$
TOTAL INVESTMENT FOR THE PROJECT:			
Total Project Cost, Excluding Lands	4,769,000	119,000	4,888,000
Interest During Construction	351,700	8,800	360,500
Lands and Damages	628,000	-	628,000
Total Investment, Including Lands	5,748,700	127,800	5,876,500
ANNUAL CHARGES FOR THE PROJECT:			
Interest	424,000	9,400	433,400
Amortization	12,400	300	12,700
Maintenance	45,500	5,800	51,300
Total Annual Charges	481,900	15,500	497,400
FEDERAL SHARE:			
Total Investment Cost			
Total Project Cost	2,328,500	59,500	2,388,000
Interest During Construction	171,700	4,400	176,100
Total Investment	2,500,200	63,900	2,564,100
Annual Charges			
Interest	184,400	4,700	189,100
Amortization	5,300	200	5,500
Maintenance	45,500 2/	-	45,500
Total Annual Charges	235,200	4,900	240,100
NON-FEDERAL SHARE:			
Total Investment Cost, Including Lands			
Total Project Cost, Excluding Lands	2,440,500	59,500	2,500,000
Interest During Construction	180,000	4,400	184,400
Lands and Damages	628,000	-	628,000
Total Investment, Including Lands	3,248,500 3/	63,900	3,312,400
Annual Charges			
Interest	239,600	4,700	244,300
Amortization	7,100	100	7,200
Maintenance	-	5,800 4/	5,800
Total Annual Charges	246,700	10,600	257,300

Source: Stage 2 Report updated to October 1980 price levels and 7-3/8 percent interest rate.

1/ 7-3/8 percent interest rate, 50-year life (i = .07375, amort. = .00216). Does not include cost for mitigation of environmental impacts.
2/ 100 percent Federal for general navigation.
3/ Excludes $4.8 million for self-liquidating costs.
4/ 100 percent non-Federal.

during construction is $5,876,500 (Table 7), and total annual charges are $497,400. Table 7 also includes cost allocation by project purpose.

(3) Economic Evaluation of Plan 1 - The detailed discussion of the projected Stage 2 recreational boating demand, fleet mix, and recreational boating benefits for Geneva State Park is presented in the Stage 2 Report for this project and is not repeated herein. In addition, paragraphs D32 through D34 of the Stage 2 Report provided an introductory discussion of breakwater fishing potential at Geneva State Park. The Columbus, OH, office of the U. S. Fish and Wildlife Service was requested to evaluate the breakwater fishing benefits for the proposed project. However, the results of this evaluation were not available at the conclusion of Stage 2 planning and thus, breakwater fishing benefits were not included in the economic evaluation of preliminary plans during Stage 2.

Since ODNR, the local sponsor, preferred a facility with 400 berths at Geneva State Park during Stage 2 planning (subsequently reduced to 360 berths during Stage 3 planning), the economic evaluation for all preliminary alternatives was based on a 400-boat marina. From Table D30 of the Stage 2 Report, the average annual direct navigation benefits for all four alternative plans was $553,900 (May 1979 price levels). Using $10,000 average annual harbor-of-refuge benefits, the total average annual navigation benefits for the four preliminary alternative plans was $563,900. Updating these benefits to October 1980 price levels by the entertainment component of the consumer price index, the total average annual navigation benefits for the four preliminary alternative plans is $636,200 (see Appendix D, paragraph D29 of this report).

Table 8, following, summarizes the annual charges, annual benefits, net benefits, and benefit-to-cost ratio for Plan 1. Net navigation benefits are $154,300 and the benefit/cost ratio for navigation is 1.32. Even with the recreational fishing benefits excluded, the B/C ratio remains favorable at 1.28.

(4) Environmental Features/Assessment of Plan 1 - Creation of a small-boat harbor at this site would disturb or alter the water circulation patterns of Cowles Creek and the lake shoreline environment at Geneva-on-the-Lake, OH. The accretion and erosion mechanisms in the immediate vicinity would be altered, although this may not be a significant problem if a sand bypass system is utilized to nourish downdrift-starved areas. Sand accreted (or placed, if a bypass system is used) could be held more effectively at Beach A (north of the bathhouse and west of Cowles Creek.)

A boat harbor at this location would sever the beach east of Cowles Creek (Beach B) from the existing bathhouse. The existing footbridge, just south of the mouth of Cowles Creek would be removed and a new walkway and footbridge would have to be constructed upstream to provide access to the bathhouse. This would require greater walking distance to the bathhouse for those people using the beach east of Cowles Creek and the surrounding parkland. This walkway would cross a road leading to the boat launch ramps, creating a potentially dangerous situation. The greater walking distance

Table 8 - Summary of Benefits and Costs for Plan 1

	Navigation	Recreational Fishing	Total Project
	$	$	$
Average Annual Benefit	636,200	Not Available 1/	636,200 1/
Average Annual Cost 2/			
Federal	235,200	4,900	240,100
Non-Federal	246,700	10,600	257,300
Total	481,900	15,500	497,400
Net Benefits	154,300	Unavailable	138,800 1/
Benefit/Cost Ratio	1.32	Unavailable	1.28 1/

Source: Stage 2 Report updated to October 1980 price levels and 7-3/8 percent interest rate.

1/ Excludes recreational breakwater fishing benefits which were not determined during Stage 2 planning.

2/ Does not include costs for mitigation of adverse environmental impacts which may, or may not, be required for Plan 1.

also would, undoubtedly, be an inconvenience to many people utilizing the park facilities. Not only would the boat harbor sever the beach from the existing bathhouse, it would also locate boating activity between Beach A and Beach B creating a potential hazard to bathers. Approximately one-half of the parking lot would also be destroyed, thus, this alternative would considerably disrupt existing park facilities.

Water quality in the vicinity of Beach B could be adversely affected by degraded water from the boat harbor. Oil, gas, and sewage spills are likely to occur in the harbor, resulting in impaired water quality to beach users. Depending on the circulation patterns in the areas during summer months, this could be a potential health hazard.

The aquatic ecosystem of Cowles Creek would also be adversely affected by implementation of such a project. However, the importance of Cowles Creek as a habitat for fish spawning, waterfowl, and shorebirds was not known at the conclusion of Stage 2 planning.

This alternative would require that a section of shoreline approximately 500 feet in length be committed for the development of this project. Substantial amounts of offshore aquatic habitat would be lost upon implementation of this alternative. A total of about 2.9 acres would be disturbed by dredging and construction of rubblemound breakwaters. The surface area of the offshore rock revetment structures would provide approximately 0.6 acre of colonizable benthic habitat, however, as well as increased fishing access. The approximately 10.3 acres of terrestrial area excavated to produce mooring facilities would create aquatic habitat. Wetland, with palustrine persistent emergent vegetation, approximately 0.9 acre, would be lost by construction of this alternative. An additional 24 acres of wetland would be vulnerable to secondary impacts resulting from increased boat traffic. The loss of wetland at Geneva-on-the-Lake could markedly decrease the fish and wildlife value of the area. The irreversible alteration of the aesthetic characteristics of the shoreline and the irretrievable commitment of materials, labor, and machinery to the construction and maintenance of the project area were also considered to be significant commitments of resources. (Note: Subsequent to completion of Stage 2 planning, the areas of Geneva State Park classified as wetland habitat were revised based on the USF&WL Service's Four-Season Study. Revisions included redefining the boundries of the wetland areas and excluding the ponds from being classified as wetland areas. These redefined wetland areas (see Plate 9 in Appendix H) were used in quantifying the loss of wetland habitat due to implementation of plans carried forward into Stage 3 planning. However, because these changes would not affect the recommendations made at the conclusion of Stage 2, the Stage 2 environmental assessments for preliminary Plans 1 through 4 were not revised.)

A 400-slip small-boat harbor in the park at Geneva-on-the-Lake would help to satisfy demand for such facilities in the area, as well as help to increase utilization of the park and its existing facilities.

In general, this alternative would position the harbor entrance in a north-northeast direction to allow sufficient depth for boaters to gain entry into

the harbor. This could pose a navigation problem to many boaters trying to enter the harbor during storms and other inclement weather conditions. As recreational craft position to enter the harbor, wind-generated waves from the northwest and southeast would strike boats broadside causing navigation difficulties. This problem could be very serious during sudden storm activity as boaters seek to gain entrance into the harbor. Winds from this direction occur with a greater frequency than any other direction. Boaters would also be required to turn immediately after entering the entrance channel which would present difficulties to sailboaters. Relocating the entrance channel would require extensive rock excavation and an increase in breakwater length which would greatly increase the cost of this alternative.

(5) Mitigation Needs for Plan 1 - The need for mitigation of adverse environmental impacts was not established in Stage 2 and, therefore, specific mitigation plans were not identified for any of the preliminary alternative plans. Suitable mitigation measures were formulated, however, for plans developed in detail in Stage 3.

(6) Implementation of Plan 1 - Of the four structural preliminary alternatives presented herein, Plan 1 was preferred by the U. S. Fish and Wildlife Service. Although it had a favorable B/C ratio and appeared to be the most compatible with the existing environmental setting, Plan 1 would seriously affect other recreational activities in the view of ODNR because it severs convenient access between Beaches A and B and isolates the bathhouse. Plan 1 was strongly opposed by ODNR, thus, having little chance for implementation.

Alternative Plan 2 - Offshore/Onshore Harbor

(1) Description of Plan 2 - Plan 2 would provide an all-weather harbor contiguous to the existing wetland/pond area and west of the bathhouse as shown on Plate 13 of Appendix H. This location was selected to limit encroachment into the wetlands and existing parking lot.

The harbor entrance would be located at a depression in the rock profile, thus, minimizing costly rock excavation. The L-shaped west breakwater, with a crest elevation of +14 (LWD) to reduce the interior design wave to 1 foot and a total length of 1,300 feet, would provide an offshore mooring area of about 7.6 acres and berthing for 300 pleasure boats. Excavation of a portion of the offshore mooring basin would be required to provide the 6-foot depth used in this study. The west breakwater would not be shore-connected to permit circulation through the mooring area. A short sandtrap breakwater would be constructed to minimize transport of littoral material into the mooring area and navigation channel. The intake for a 6-inch sand bypass pipe would be located near this trap. Access for fishing from the west breakwater would be provided by a footbridge. The shoreline within the offshore mooring area would be shaped and riprapped to prevent erosion from wave action created by recreational craft. For planning purposes, it was assumed that the public dock would be located offshore in an area relatively convenient to the navigation channel. The east breakwater would be 600 feet long and shore-connected to provide needed wave protection and access for breakwater fishing. In addition, a 6-inch sand bypass pipe would be placed between the east and west breakwaters to prevent starvation of the down-drift shoreline.

Because the offshore berthing area would be a considerable distance from the existing parking lot (about 3,000 feet by a rather circuitous route around the wetlands), it appeared that additional parking facilities in closer proximity to the offshore area would be required to realize the full recreational navigation benefits for Plan 2. One possible solution would be to provide a parking area near the west breakwater. This matter was discussed with ODNR and would have been resolved in Stage 3 if Plan 2 was selected for further, more detailed study.

The interior channel, which would provide access to the onshore mooring area, was located to limit encroachment into the wetlands and existing parking area. The westerly side would be riprapped to prevent erosion from wash created by passing craft. An L-shaped mooring area of about 2.5 acres would provide berthage for 100 boats. As with Plan 1, a vertical concrete wall was used to prevent encroachment into the parking area. Launching ramps at the southerly limit of the project would be convenient to the existing parking area.

(2) Cost Estimate for Plan 2 - Table C3 of Appendix C is the detailed cost estimate for Plan 2. Table 9, following, summarizes the project costs and shows the apportionment of costs to project interests. The breakdown of annual charges by project purpose is presented in Table 10. The project cost for Plan 2 is $5,054,000 (Table 9); the total investment cost, including interest during construction, is $5,412,100 (Table 10); and the annual charges, including maintenance, are $462,300.

Table 9 - Estimate of Total Project Cost for Alternative Plan 2 (October 1980 Price Levels)

Item	Amount	Total
	$	$
TOTAL PROJECT COSTS:		
1. Channels	1,065,000	
2. Breakwaters	2,319,000	
3. Recreational Facilities	257,000 1/	
4. Aids to Navigation	56,000 2/	
5. Lands and Damages	198,000	
6. Engineering and Design	846,000 3/	
7. Supervision and Administration	313,000	
Total Project Cost		5,054,000 4/
FEDERAL SHARE:		
50 Percent of Items 1, 2, 3, 6, and 7	2,400,000	
Aids to Navigation (U. S. Coast Guard)	56,000	
Total Federal Share of Project Costs		2,456,000 4/
NON-FEDERAL SHARE:		
Cash Contribution (50 Percent of Items 1, 2, 3, 6, and 7	2,400,000	
Lands and Damages	198,000	
Total Non-Federal Share of Project Costs		2,598,000 4/ 5/

Source: Stage 2 Report updated to October 1980 price levels.

1/ Footbridge, walkways, and handrails for breakwater fishing.

2/ Cost includes necessary E&D and S&A.

3/ Includes $124,000 for hydraulic model study.

4/ Does not include costs for mitigation of adverse environmental impacts that may be required for Plan 2. Costs for mitigation, if required, will be included in Stage 3, as appropriate.

5/ Does not include non-Federal cost for self-liquidating features of the project which is estimated at $4.14 million (October 1980 price levels.)

Table 10 - Estimated Investment Cost and Annual Charges for Alternative Plan 2 (October 1980 Price Levels)1/

Item	Navigation	Recreation	Total
	$	$	$
TOTAL INVESTMENT FOR THE PROJECT:			
Total Project Cost, Excluding Lands	4,599,000	257,000	4,856,000
Interest During Construction	339,100	19,000	358,100
Lands and Damages	198,000	-	198,000
Total Investment, Including Lands	5,136,100	276,000	5,412,100
ANNUAL CHARGES FOR THE PROJECT:			
Interest	378,800	20,400	399,200
Amortization	11,100	600	11,700
Maintenance	41,900	9,500	51,400
Total Annual Charges	431,800	30,500	462,300
FEDERAL SHARE:			
Total Investment Cost			
Total Project Cost	2,327,500	128,500	2,456,000
Interest During Construction	171,600	9,500	181,100
Total Investment	2,499,100	138,000	2,637,100
Annual Charges			
Interest	184,300	10,200	194,500
Amortization	5,400	300	5,700
Maintenance	41,900 2/	-	41,900
Total Annual Charges	231,600	10,500	242,100
NON-FEDERAL SHARE:			
Total Investment Cost, Including Lands			
Total Project Cost, Excluding Lands	2,271,500	128,500	2,400,000
Interest During Construction	167,500	9,500	177,000
Lands and Damages	198,000	-	198,000
Total Investment, Including Lands	2,637,000 3/	138,000	2,775,000
Annual Charges			
Interest	194,500	10,200	204,700
Amortization	5,700	300	6,000
Maintenance	-	9,500 4/	9,500
Total Annual Charges	200,200	20,000	220,200

Source: Stage 2 Report updated to October 1980 price levels and 7-3/8 percent interest rate.

1/ 7-3/8 percent interest rate, 50-year life (i = .07375, amort. = .00216). Does not include cost for mitigation of environmental impacts.
2/ 100 percent Federal for general navigation.
3/ Excludes $4.14 million for self-liquidating costs.
4/ 100 percent non-Federal.

(3) Economic Evaluation of Plan 2 - As for Plan 1 previously discussed, the total average annual navigation benefits for Plan 2 are $636,200 (October 1980 price levels) for the proposed 400-slip facility. A summary of annual charges, annual benefits, net benefits, and benefit-to-cost ratio by project purpose is presented in Table 11, below. Net benefits for recreational navigation are $204,400 and the B/C ratio is 1.47. The net benefits for the total project, excluding undetermined fishing benefits, would be $173,900, and the B/C ratio is 1.38.

Table 11 - Summary of Benefits and Costs for Plan 2

	Navigation	Recreational Fishing	Total Project
	$		
Average Annual Benefit	636,200	Not Available1/	636,2001/
Average Annual Cost 2/			
Federal	231,600	10,500	242,100
Non-Federal	200,200	20,000	220,200
Total	431,800	30,500	462,3001/
Net Benefits	204,400	Unavailable	173,900
Benefit/Cost Ratio	1.47	Unavailable	1.381/

Source: Stage 2 Report updated to October 1980 price levels and 7-3/8 percent interest rate.

1/ Excludes recreational breakwater fishing benefits which were not determined during Stage 2 planning.

2/ Does not include costs for mitigation of adverse environmental impacts which may, or may not, be required for Plan 2.

(4) Environmental Features/Assessment of Plan 2 - Construction of a small-boat harbor at this site would place the facility in a sheltered position with respect to storm and wave activity. The accretion and erosion mechanisms in the immediate vicinity would be altered, however, a sand bypass system would be utilized to nourish downdrift-starved areas. Approximately 2.6 acres of wetland would be irreversibly lost, however, the U. S. Fish and Wildlife Service had indicated that mitigation would likely be feasible.

Creation of a small-craft facility at this location could alter the water levels and current patterns in the wetland area. The vegetation characteristic of the wetland would probably be altered or changed at a greater rate than natural successional processes would allow for. These changes could alter existing habitat types and influence the diversity of animals presently utilizing the area. Additionally, the proximity of the harbor may preclude use of the marsh by those waterfowl that are least tolerant of disturbance.

This alternative would require that a section of shoreline approximately 1,200 feet in length be committed for the development of this project. Approximately 16 acres of offshore aquatic habitat would be disturbed by dredging and construction of rubblemound breakwaters. The surface area of the offshore rock revetment structures would provide approximately 1.2 acres of colonizable benthic habitat, however, as well as increased fishing access. The approximately 5.3 acres of terrestrial area excavated to produce mooring facilities would create aquatic habitat. Approximately 2.6 acres of wetland would be lost by construction of this alternative. The irreversible alteration of the aesthetic characteristics of the shoreline and the irretrievable commitment of materials, labor, and machinery to the construction and maintenance of the project area were also considered to be significant commitments of resources.

The loss of approximately 2.6 acres of wetlands is undoubtedly the major irreversible loss associated with this alternative. In addition, about 22.4 acres of wetland would receive direct disturbance by the noise, dust, and water craft emissions characteristic of most boat harbors.

Under this alternative, all existing park facilities, beaches, and parking areas would remain intact. A 400-slip small-boat harbor in the park at Geneva-on-the-Lake would help to satisfy demand for such facilities in the area, as well as help to increase utilization of the park and its existing facilities.

(5) Mitigation Needs for Plan 2 - The need for mitigation of adverse environmental impacts was not established during Stage 2 and, therefore, specific mitigation plans were not identified for any of the preliminary alternative plans. Mitigative measures would have been investigated in Stage 3 if Plan 2 was selected for additional detailed study.

(6) Implementation of Plan 2 - Plan 2 was economically justified and appeared to be environmentally viable. It was one of the two alternative plans recommended for further consideration by the U. S. Fish and Wildlife Service. Although ODNR did not identify Plan 2 for further consideration, the Buffalo District considered it to be a reasonable compromise between the environmental and functional concerns at Geneva State Park. It was, therefore, concluded that Plan 2 was probably implementable and should be considered further in Stage 3 of this Phase I study.

Alternative Plan 3 - Wetland/Parking Lot Harbor

(1) Description of Plan 3 - Plan 3 would provide an onshore, all-weather harbor with berthing for 400 boats on lands about equally distributed between the wetlands and parking lot. The proposed plan is shown on Plate 14 of Appendix H.

The harbor entrance would be located to take advantage of the existing rock trough and would be protected by an arrowhead breakwater system. Because of the trough, the breakwaters would be relatively short, aggregating 1,050 feet. Both arms would be shore-connected, thus, providing access for breakwater fishing. Since the west breakwater would be remote from existing parking and other park facilities, an access road to the breakwater and nearby parking would be required to realize the full fishing benefit. This aspect was pursued in depth in Stage 3 since Plan 3 was selected for further study. A sand bypass system would be incorporated into the project for downdrift nourishment.

The entrance channel would be oriented in a south-southeasterly direction to bypass the mouth of the intermittant stream with the objective of minimizing the impact on the wetland area. A short, low jetty would be required on the west side of the channel at the lake-land interface to provide a stable channel at this location, and to prevent encroachment into the intermittant stream a short distance to the west. The remainder of the connecting channel would be riprapped to prevent erosion of the sideslopes from prop-wash. The interior channel would service a large basin of about 7.9 acres with berths for 340 boats to the south, and a small mooring area of 1.4 acres with 60 berths to the north. The perimeter of the marina complex would be protected by riprap and vertical concrete walls. The public dock would be located south of the existing bathhouse and the launching ramps at the northeast corner of the marina, convenient to existing parking.

(2) Cost Estimate for Plan 3 - The detailed cost estimate for Plan 3 is presented in Table C-4 of Appendix C. Table 12, following, summarizes the project costs, including apportionment of costs to project interests. Allocation of costs to project purposes and annual charges are shown in Table 13. Principal costs for Plan 3 are for constructing the channels and breakwaters, about equally distributed, and the total project cost, including lands, is $4,254,000 (Table 12.) The total investment cost including lands and interest during construction (2-year construction period) is $4,530,400, and total annual charges are $382,800 (Table 13).

(3) Economic Evaluation of Plan 3 - As for Plans 1 and 2, the total average annual navigation benefits for Plan 3 are $636,200. Recreational breakwater fishing benefits were not determined during Stage 2. Annual benefits, annual charges, net benefits, and the benefit-to-cost ratio by project purpose are presented in Table 14. Net benefits for navigation are estimated at $267,400 and the benefit-to-cost ratio is 1.73. Excluding recreational breakwater fishing benefits, the net benefits and B/C ratio for the total project are, $253,400 and 1.66, respectively. As with the other plans, the values stated do not include costs for mitigation of adverse environmental effects, which could be considerable for Plan 3.

Table 12 - Estimate of Total Project Cost for Alternative Plan 3
(October 1980 Price Levels)

Item	Amount	Total
	$	$
TOTAL PROJECT COSTS:		
1. Channels	1,349,000	
2. Breakwaters	1,183,000	
3. Recreational Facilities	108,000 1/	
4. Aids to Navigation	28,000 2/	
5. Lands and Damages	506,000	
6. Engineering and Design	835,000 3/	
7. Supervision and Administration	245,000	
Total Project Cost		4,254,000 4/
FEDERAL SHARE:		
50 Percent of Items 1, 2, 3, 6, and 7	1,860,000	
Aids to Navigation (U. S. Coast Guard)	28,000	
Total Federal Share of Project Costs		1,888,000 4/
NON-FEDERAL SHARE:		
Cash Contribution (50 Percent of Items 1, 2, 3, 6, and 7	1,860,000	
Lands and Damages	506,000	
Total Non-Federal Share of Project Costs		2,366,000 4/ 5/

Source: Stage 2 Report updated to October 1980 price levels.

1/ Walkways and handrails for breakwater fishing.

2/ Cost includes necessary E&D and S&A.

3/ Includes $124,000 for hydraulic model study.

4/ Does not include costs for mitigation of adverse environmental impacts that may be required for Plan 3. Mitigation will be evaluated in Stage 3, as appropriate.

5/ Does not include non-Federal cost for self-liquidating features of the project which is estimated at $4.78 million (October 1980 price levels.)

Table 13 - Estimated Investment Cost and Annual Charges for Alternative Plan 3 (October 1980 Price Levels)1/

Item	Navigation $	Recreation $	Total $
TOTAL INVESTMENT FOR THE PROJECT:			
Total Project Cost, Excluding Lands	3,640,000	108,000	3,748,000
Interest During Construction	268,400	8,000	276,400
Lands and Damages	506,000	-	506,000
Total Investment, Including Lands	4,414,400	116,000	4,530,400
ANNUAL CHARGES FOR THE PROJECT:			
Interest	325,600	8,500	334,100
Amortization	9,500	300	9,800
Maintenance	33,700	5,200	38,900
Total Annual Charges	368,800	14,000	382,800
FEDERAL SHARE:			
Total Investment Cost			
Total Project Cost	1,834,000	54,000	1,888,000
Interest During Construction	135,200	4,000	139,200
Total Investment	1,969,200	58,000	2,027,200
Annual Charges			
Interest	145,200	4,300	149,500
Amortization	4,300	100	4,400
Maintenance	33,700 2/	-	33,700
Total Annual Charges	183,200	4,400	187,600
NON-FEDERAL SHARE:			
Total Investment Cost, Including Lands			
Total Project Cost, Excluding Lands	1,806,000	54,000	1,860,000
Interest During Construction	133,200	4,000	137,200
Lands and Damages	506,000	-	506,000
Total Investment, Including Lands	2,445,200 3/	58,000	2,503,200
Annual Charges			
Interest	180,400	4,200	184,600
Amortization	5,200	200	5,400
Maintenance	-	5,200 4/	5,200
Total Annual Charges	185,600	9,600	195,200

Source: Stage 2 Report updated to October 1980 price levels and 7-3/8 percent interest rate.

1/ 7-3/8 percent interest rate, 50-year life (i = .07375, amort. = .00216). Does not include cost for mitigation of environmental impacts.
2/ 100 percent Federal for general navigation.
3/ Excludes $4.78 million for self-liquidating costs.
4/ 100 percent non-Federal.

Table 14 - Summary of Benefits and Costs for Plan 3

	Navigation	Recreational Fishing	Total Project
	$		
Average Annual Benefit	636,200	Not Available1/	636,2001/
Average Annual Cost2/			
Federal	183,200	4,400	187,600
Non-Federal	185,600	9,600	195,200
Total	368,800	14,000	382,800 1/
Net Benefits	267,400	Unavailable	253,400
Benefit/Cost Ratio	1.73	Unavailable	1.66 1/

Source: Stage 2 Report updated to October 1980 price levels and 7-3/8 percent interest rate.

1/ Excludes recreational breakwater fishing benefits which were not determined during Stage 2 planning.

2/ Does not include costs for mitigation of adverse environmental impacts which may, or may not, be required for Plan 3.

(4) Environmental Features/Assessment of Plan 3 - Construction of a small-boat harbor at this site would place the facility in a sheltered position with respect to storm and wave activity. The accretion and erosion mechanisms in the immediate vicinity would be altered, however, a sand bypass system would be utilized to nourish downdrift-starved areas. The plan would require that a section of shoreline, approximately 800 feet in length, be committed for the development of this project. In addition, approximately 2.6 acres of offshore aquatic habitat would be disturbed by dredging and construction of rubblemound breakwaters. The surface area of the offshore rock revetment structures would provide approximately 0.6 acre of colonizable benthic habitat, however, as well as increased fishing access. The approximately 12.5 acres of terrestrial area excavated to produce mooring facilities would create aquatic habitat. Approximately 5 acres of wetland would be lost by construction of this alternative. The irreversible alteration of aesthetic characteristics of the shoreline and the irretrievable commitment of materials, labor, and machinery to the construction and maintenance of the project area were also considered to be significant commitments of resources.

Approximately 5 acres of wetland would be irreversibly lost by implementation of this alternative. Development of this facility could cause further degradation to the 20 remaining acres and associated habitat types as they would receive direct disturbance by the noise, dust, and water craft emissions characteristic of most boat harbors. The impact of this alternative on the wetland area is basically the same as Alternative 2.

Although this alternative would destroy a portion of the parking lot (approximately one-fourth) and would reduce access to the bathhouse, its impact would not be as severe as Alternative 1. Alternative 3 would not interfere with access between Beach A and Beach B. A 400-slip small-boat harbor in the park at Geneva-on-the-Lake would help to satisfy demand for such facilities in the area as well as help to increase utilization of the park and its existing facilities.

(5) Mitigation Needs for Plan 3 - The need for mitigation of adverse environmental impacts was not determined during Stage 2. However, since the layout presented would displace about 5 acres of wetland, construction in kind would undoubtedly be required. Since Plan 3 was selected for additional detailed study at the conclusion of Stage 2, specific mitigative measures were investigated during Stage 3.

(6) Implementation of Plan 3 - Based on 17 July 1979 correspondence from ODNR (Exhibit E-13 of Appendix E), a modified Plan 3 was the apparent preference of that agency. In the accompanying drawings, ODNR showed a reduction in the desired harbor capacity from 400 slips to either 300 or 360 slips. This being the case, it was probable that the associated construction could be oriented to reduce the amount of wetland displaced. Although the U. S. Fish and Wildlife Service indicated opposition to Plan 3 (Exhibits E-11 and E-12 of Appendix E), it was the District's position that Plan 3 was a reasonable compromise and probably could be implemented, particularly with the modification in capacity suggested by ODNR.

Alternative Plan 4 - Wetlands Harbor

(1) Description of Plan 4 - Plan 4 would provide an onshore all-weather harbor with berthing for 400 boats in the easterly portion of the wetlands area adjacent to the existing parking lot. The proposed plan is shown on Plate 15 of Appendix H.

The breakwaters and entrance channel would be similar to those for Plan 3 except that the orientation of these features would be shifted to provide a more nearly north-south alignment to reduce the length of the west breakwater. A short spending beach would be constructed to the east of the entrance channel to prevent transmittal of the attenuated design wave in the entrance into the mooring area. A sand bypass system would be incorporated into the project for down-drift nourishment.

The mooring area would aggregate about 9.6 acres primarily in the wetlands. The periphery would be protected against erosion from prop-wash by riprap or vertical concrete walls. The public service facilities and boat launching ramps would be located at the east end of the marina convenient to existing parking.

(2) Cost Estimate for Plan 4 - The detailed cost estimate for Plan 4 is presented in Table C-5 of Appendix C. Table 15, following, summarizes the project costs, including apportionment to project interests. Annual charges, allocated by project purpose, are shown in Table 16. The total project cost for Plan 4 is estimated at $3,443,000, the total investment $3,687,000, and annual charges would be $316,800.

Table 15 - Estimate of Total Project Cost for Alternative Plan 4
(October 1980 Price Levels)

Item	Amount	Total
	$	$
TOTAL PROJECT COSTS:		
1. Channels	910,000	
2. Breakwaters	1,229,000	
3. Recreational Facilities	93,000 1/	
4. Aids to Navigation	28,000 2/	
5. Lands and Damages	135,000	
6. Engineering and Design	831,000 3/	
7. Supervision and Administration	217,000	
Total Project Cost		3,443,000 4/
FEDERAL SHARE:		
50 Percent of Items 1, 2, 3, 6, and 7	1,640,000	
Aids to Navigation (U. S. Coast Guard)	28,000	
Total Federal Share of Project Costs		1,668,000 4/
NON-FEDERAL SHARE:		
Cash Contribution (50 Percent of Items 1, 2, 3, 6, and 7	1,640,000	
Lands and Damages	135,000	
Total Non-Federal Share of Project Costs		1,775,000 4/ 5/

Source: Stage 2 Report updated to October 1980 price levels.

1/ Walkways and handrails for breakwater fishing.

2/ Cost includes necessary E&D and S&A.

3/ Includes $124,000 for hydraulic model study.

4/ Does not include costs for mitigation of adverse environmental impacts that may be required for Plan 4. Mitigation will be evaluated in Stage 3, as appropriate.

5/ Does not include non-Federal cost for self-liquidating features of the project which is estimated at $4.37 million (October 1980 price levels.)

Table 16 - Estimated Investment Cost and Annual Charges for Alternative Plan 4 (October 1980 Price Levels)1/

Item	Navigation	Recreation	Total
	$	$	$
TOTAL INVESTMENT FOR THE PROJECT:			
Total Project Cost, Excluding Lands	3,215,000	93,000	3,308,000
Interest During Construction	237,100	6,900	244,000
Lands and Damages	135,000	-	135,000
Total Investment, Including Lands	3,587,100	99,900	3,687,000
ANNUAL CHARGES FOR THE PROJECT:			
Interest	264,500	7,400	271,900
Amortization	7,800	200	8,000
Maintenance	32,400	4,500	36,900
Total Annual Charges	304,700	12,100	316,800
FEDERAL SHARE:			
Total Investment Cost			
Total Project Cost	1,621,500	46,500	1,668,000
Interest During Construction	119,500	3,500	123,000
Total Investment	1,741,000	50,000	1,791,000
Annual Charges			
Interest	128,400	3,700	132,100
Amortization	3,800	100	3,900
Maintenance	32,400 2/	-	32,400
Total Annual Charges	164,600	3,800	168,400
NON-FEDERAL SHARE:			
Total Investment Cost, Including Lands			
Total Project Cost, Excluding Lands	1,593,500	46,500	1,640,000
Interest During Construction	117,600	3,400	121,000
Lands and Damages	135,000	-	135,000
Total Investment, Including Lands	1,846,100 3/	49,900	1,896,000
Annual Charges			
Interest	136,100	3,700	139,800
Amortization	4,000	100	4,100
Maintenance	-	4,500 4/	4,500
Total Annual Charges	140,100	8,300	148,400

Source: Stage 2 Report updated to October 1980 price levels and 7-3/8 percent interest rate.

1/ 7-3/8 percent interest rate, 50-year life (i = .07375, amort. = .00216). Does not include cost for mitigation of environmental impacts.
2/ 100 percent Federal for general navigation.
3/ Excludes $4.37 million for self-liquidating costs.
4/ 100 percent non-Federal.

(3) Economic Evaluation of Plan 4 - The total average annual navigation benefits are $636,200 as previously discussed. Recreational breakwater fishing benefits were not determined during Stage 2. From Table 17, below, the net benefits for navigation are $331,500 and the benefit-to-cost ratio is 2.09 (excludes cost for mitigation which could be considerable for Plan 4.)

Table 17 - Summary of Benefits and Costs for Plan 4

	Navigation	Recreational Fishing	Total Project
	$		
Average Annual Benefit	636,200	Not Available1/	636,2001/
Average Annual Costs2/			
Federal	164,600	3,800	168,400
Non-Federal	140,100	8,300	148,400
Total	304,700	12,100	316,8001/
Net Benefits	331,500	Unavailable	319,400
Benefit/Cost Ratio	2.09	Unavailable	2.011/

Source: Stage 2 Report updated to October 1980 price levels and 7-3/8 percent interest rate.

1/ Excludes recreational breakwater fishing benefits which were not determined during Stage 2 planning.

2/ Does not include costs for mitigation of adverse environmental impacts which may, or may not, be required for Plan 4.

(4) Environmental Features/Assessments of Plan 4 - Construction of a small-boat harbor at this site would place the facility in a sheltered position with respect to storm and wave activity. The accretion and erosion mechanisms in the immediate vicinity would be altered, however, a sand bypass system would be utilized to nourish downdrift-starved areas.

Alternative 4 would directly destroy approximately 17.6 acres of wetland. Indirect impacts to the remaining 7.4 acres would be more serious than those associated with any of the other alternatives. The value of the entire wetland would be destroyed by the disturbances of noise, dust, and water craft emissions characteristic of most boat harbors. Although this is the least costly alternative, the amount that would have to be spent on wetland mitigation would be very high, therefore, possibly making this plan more costly than any of the other alternatives. Water levels in the swamp would also be severely lowered. Additionally, the proximity of the harbor to the larger borrow pit and to the swamp would almost certainly reduce their use by various species of wildlife.

This alternative would require that a section of shoreline approximately 600 feet in length be committed for the development of this project. Approximately 3.9 acres of offshore aquatic habitat would be disturbed by

dredging and construction of rubblemound breakwaters. The surface area of the offshore rock revetment structures would provide approximately 0.5 acre of colonizable benthic habitat, however, as well as increased fishing access. The approximately 12.2 acres of terrestrial area excavated to produce mooring facilities would create aquatic habitat. The irreversible alteration of the aesthetic characteristics of the shoreline and the irretrievable commitment of materials, labor, and machinery to the construction and maintenance of the project area were also considered to be significant commitments of resources.

This alternative leaves all existing park facilities, including beaches and parking areas, intact. A 400-slip small-boat harbor in the park at Geneva-on-the-Lake would help to satisfy demand for such facilities in the area as well as help to increase utilization of the park and its existing facilities.

(5) Mitigation Needs for Plan 4 - Plan 4 would directly destroy nearly 18 acres of wetland, and indirectly impact on the remaining 7 acres. As a minimum, replacement in kind by man-made construction would be required. The need for other mitigation of adverse environmental impacts was not known at the conclusion of Stage 2 planning and was not considered further since Plan 4 was subsequently eliminated from further consideration at the conclusion of Stage 2.

(6) Implementation of Plan 4 - Plan 4 was opposed by the U. S. Fish and Wildlife Service. In addition, the Buffalo District concluded that since there were practical alternatives to Plan 4 which would occupy most of the wetland, Plan 4 was not a viable plan and should not be implemented.

Alternative Plan 5 - No-Action

The "no-action" or "do-nothing" plan represents the base condition for evaluation of the four structural plans previously described. This option, although not favored by local project sponsors and the recreational boating community, avoids both the monetary investments and potential adverse impacts associated with structural improvements. The plan would not meet any of the needs of boaters or recreational fishermen in the area. It would not provide a harbor-of-refuge for pleasure craft along a relatively long, unprotected reach of Lake Erie shoreline that presently has no such facilities. Problems stated earlier in this report would remain unchanged. The "no-action" plan would not meet the planning objective to provide a safe, all-weather small-boat facility in the study area. However, Plan 5 would, at least temporarily, assure the preservation of the wetland area that would be disturbed or destroyed by construction of a small-boat harbor at Geneva State Park.

COMPARISON OF PRELIMINARY PLANS

A summary matrix of the comparative costs, benefits, and economic efficiency for each of the five preliminary alternative plans considered during Stage 2 is presented in Table 18, below. This is followed by Table 19 that provides an abbreviated "summary of effects" for the five plans based on information available at the conclusion of Stage 2 planning.

Table 18 - Economic Comparison of Preliminary Alternative Plans 1 Through 5
(October 1980 Price Levels)

Item	Plan 1 Cowles Creek Harbor	Plan 2 Offshore-Onshore Harbor	Plan 3 Wetland/Parking Lot Harbor	Plan 4 Wetlands Harbor	Plan 5 No-Action
	$	$	$	$	
Total Project Investment 1/					
Federal	2,564,100	2,637,100	2,027,200	1,791,000	-
Non-Federal	3,312,400	2,775,000	2,503,200	1,896,000	-
Total	5,876,500	5,412,100	4,530,400	3,687,000	-
Self-Liquidating Costs 2/					
Non-Federal	4,800,000	4,140,000	4,780,000	4,370,000	-
Annual Charges					
Federal	240,100	242,100	187,600	168,400	-
Non-Federal	257,300	220,200	195,200	148,400	-
Total	497,400	462,300	382,800	316,800	-
Annual Benefits 3/	636,200	636,200	636,200	636,200	-
Net Benefits 3/	138,800	173,900	253,400	319,400	-
Benefit/Cost Ratio 3/	1.28	1.38	1.66	2.01	-

1/ Includes cost of lands and damages and costs for recreational fishing facilities. Does not include cost for mitigation of adverse environmental impacts which may, or may not, be required for Plans 1-4. The need for mitigation will be determined in Stage 3.

2/ Includes estimated costs for excavating mooring areas; docks for 400 berths, public services facilities and launching ramps. Since these costs are considered self-liquidating, they are not included as part of the total project investment in determining the economic efficiency.

3/ Does not include the recreational breakwater fishing benefits which were not available at the conclusion of Stage 2 planning.

Table 19 - Summary of Effects for Preliminary Alternative Plans 1 Through 5

	Alternatives				
	Plan 1 Cowles Creek Harbor	Plan 2 Offshore-Onshore Harbor	Plan 3 Wetlands/Parking Lot Harbor	Plan 4 Wetlands Harbor	Plan 5 No-Action
	(Figures are average annual equivalent values in $1,000 except where noted)				
A. Plan Description	400-berth all-weather facility at Cowles Creek. Provides fishing from west breakwater.	400-berth all-weather facility with 300 berths offshore and 100 berths onshore at wetlands-parking lot interface. Provides for breakwater fishing.	400-berth all-weather onshore facility about equally divided between wetlands and parking lot. Provides for breakwater fishing.	400-berth all-weather facility occupying about 17 acres of wetland. Provides for breakwater fishing.	Do-nothing
B. Significant Impacts					
1. National Economic Development					
a. Beneficial Impacts					
(1) Recreational Navigation	$ 636.2	$ 636.2	$ 636.2	$ 636.2	None
(2) Recreational Fishing	To be determined.	To be determined.	To be determined.	To be determined.	None
b. Adverse Impacts					
(1) Project Investment Cost1/	$5,876.5	$5,412.1	$4,530.4	$3,687.0	None
(2) Self-liquidating Cost2/	4,800.0	4,140.0	4,780.0	4,370.0	None
(3) Annual Charges	497.4	462.3	382.8	316.8	None
(4) Net Benefits3/	138.8	173.9	253.4	319.4	None
(5) B/C Ratio3/	1.28	1.38	1.66	2.01	
2. Environmental Quality					
a. Beneficial Impacts					
(1) Aquatic habitat created (Excavated areas in the entrance channel and berthing area)	10.3 acres	5.3 acres	12.5 acres	12.2 acres	None
(2) Colonizable benthic habitat created. (Surface area of breakwater system below average lake level.)	0.6 acre	1.2 acres	0.6 acre	0.5 acre	None

Table 19 - Summary of Effects for Preliminary Alternative Plans 1 Through 5 (Cont'd)

	Alternatives				
	Plan 1 Cowles Creek Harbor	Plan 2 Offshore-Onshore Harbor	Plan 3 Wetlands/Parking Lot Harbor	Plan 4 Wetlands Harbor	Plan 5 No-Action
b. Adverse Impacts					
(1) Terrestrial habitat destroyed (area of new aquatic habitat plus periphery)	12.8 acres	8.1 acres	15.1 acres	14.9 acres	None
(2) Aquatic habitat disrupted (twice the area occupied by the breakwaters and entrance channel)	2.9 acres	5.4 acres	2.6 acres	3.9 acres	None
(3) Wetlands disrupted (wetland area occupied by the mooring areas and peripheral areas subject to disruption)	0.9 acre	2.6 acres	5.0 acres	17.6 acres	None
3. Social Well-Being					
a. Beneficial Impacts					
(1) Recreational, educational and cultural opportunities.	Increased recreation from boating and fishing.	Increased recreation from boating and fishing	Increased recreation from boating and fishing	Increased recreation from boating and fishing	None
(2) Enhancement of health, safety, and community well-being.	Significant increase in safety from harbor-of-refuge.	Significant increase in safety from harbor-of-refuge.	Significant increase in safety from harbor-of-refuge.	Significant increase in safety from harbor-of-refuge.	None
(3) Public and agency acceptability.	Acceptable to and preferred by USF&WLS who recommendsed this plan for further consideration. They were also of the opinion that Plan 1 appeared to involve the least direct and indirect impacts upon the wetlands and would probably involve the lowest	Qualified acceptability by USF&WLS subject to change contingent upon results of completion of four-seasons study. ODNR did not indicate any position on Plan 2.	Unacceptable to USF&WLS because it impacts on the northeast portion of the wetlands and should be dropped from further consideration because there are other alternatives less damaging to the wetlands.	Unacceptable to USF&WLS because it damages or destroys most of the wetlands. Preferred by State of Ohio because it is the least costly (excluding mitigation which probably would increase the cost above Plan 1) and least disruptive to other park	Unacceptable to the State of Ohio and boating public.

Table 19 - Summary of Effects for Preliminary Alternative Plans 1 Through 5 (Cont'd)

	Alternatives				
	Plan 1 Cowles Creek Harbor	Plan 2 Offshore-Onshore Harbor	Plan 3 Wetlands/Parking Lot Harbor	Plan 4 Wetlands Harbor	Plan 5 No-Action
	cost for mitigation of environmental impacts. Unacceptable to State of Ohio primarily because it severs convenient access between two recreation beaches and high project and self-liquidating costs. Unacceptable to ODNR because it severs Beaches A and B and isolates the bathhouse.		Preferred by ODNR. By 17 July 1979 letter, ODNR indicated that the small-boat facility should be reduced to 300 or 360 slips.	facilities. Unacceptable to Buffalo District because there were "practical" alternatives to Plan 4 which would destroy the wetland.	
b. Adverse Impacts (1) Degaded recreational, educational, and cultural opportunities.	Some. Severs convenient access between two recreational beaches.	Possible limited degradation of such activities as birdwatching, etc. due to boating activities nearby.	Similar to Plan 2.	Probable significant degradation in birdwatching opportunities, etc. due to construction and operation of boating facilities in the wetlands.	None
(2) Deterioration in quality of life, health, and safety.	Temporary air, water, and noise pollution during construction. Noise pollution throughout project life. Potential hazard to swimmers in close proximity to pleasure craft.	Temporary air, water, and noise pollution during construction. Noise pollution throughout project life.	Same as Plan 2	Same as Plan 2	No harbor of-refuge for pleasure craft.

Table 19 - Summary of Effects for Preliminary Alternative Plans 1 Through 5 (Cont'd)

	Alternatives				
	Plan 1 Cowles Creek Harbor	Plan 2 Offshore-Onshore Harbor	Plan 3 Wetlands/Parking Lot Harbor	Plan 4 Wetlands Harbor	Plan 5 No-Action
(3) Injurious displacement of people and community disruption	None	None	None	None	None
4. Regional Development					
a. Beneficial Impacts					
(1) Value of increased income.	Increased income to individual and local businesses.	Same as Plan 1	Same as Plan 1	Same as Plan 1	None
(2) Quality of increased employment.	Some increase in local and regional employment.	Same as Plan 1	Same as Plan 1	Same as Plan 1	None

1/ Includes cost of lands and damages and costs for recreational fishing facilities. Does not include cost for mitigation of adverse environmental impacts which may, or may not, be required for Plans 1-4. The need for mitigation will be determined in Stage 3.

2/ Includes estimated costs for excavating mooring areas; docks for 400 berths, public services facilities and launcing ramps. Since these costs are considered self-liquidating, they are not included as part of the total project investment in determining the economic efficiency.

3/ Does not include the recreational breakwater fishing benefits which were not available at the conclusion of Stage 2 planning.

Trade-Off Analysis

Four of the five preliminary plans considered for in-depth Stage 2 study were structural plans that would provide an all-weather harbor with berthing for 400 boats and comparable launching facilities for trailer-drawn boats. Each of these structural alternatives would also provide breakwater fishing opportunities. The fifth alternative was the "no-action," or do-nothing alternative which would enhance neither recreational boating or fishing opportunities in the project area.

(1) Trade-off Analysis of "No-Action" vs. Structural Alternatives - As previously stated, the no-action plan would not meet any of the regional and local demand for recreational boating and land-based fishing. It would require no monetary investment, preclude the potential for conflict with other park activities and facilities such as swimming beaches and the bathhouse, and eliminate the probable need for mitigation of adverse environmental impacts and project-induced shoreline erosion. The trade-offs for the four structural alternatives would be the converse of those for the no-action alternative.

(2) Trade-Offs for the Four Structural Alternatives - Each of the four structural alternatives would provide an all-weather harbor for 400 boats, comparable boat-launching and service facilities, and a harbor-of-refuge for transient craft. The space available for breakwater fishing varies for the four alternatives dependent upon location and configuration of the breakwaters. The available lengths vary from a minimum of 550 feet for Plan 1; 570 feet for Plan 4; 740 feet for Plan 3; to a maximum of 1,660 feet for Plan 2.

In devising the four structural plans, primary considerations were project costs, potential adverse environmental impacts and adverse effects on existing and proposed park facilities. From Table 19, preceeding, the apparent least costly alternative was Plan 4 at $3.69 million and the most costly was Plan 1 at $5.89 million. However, if mitigation of adverse environmental impacts is required, it is probable that the total project investment cost for all four alternatives would be comparable. The self-liquidating costs that would be borne by non-Federal interests would vary from a minimum of $4.14 million for Plan 2 to a maximum of $4.8 million for Plan 1 (see Table 18). Costs for additional parking required (Plan 2) are not included. In summary, and in the absence of a determination regarding mitigation, it was speculated at the conclusion of Stage 2 that Plan 1 would be the most costly but least environmentally damaging alternative, and Plan 4 the least costly but most environmentally damaging alternative. Plans 2 and 3 would fall somewhere in between when comparing the economic/environmental trade-offs.

With regard to social trade-offs, Plan 1 would sever convenient access between Beaches A and B while the other alternatives would preserve the integrity of this park feature. All plans would present an inconvenience to the visitor desiring to stroll along the shoreline in the park.

Rationale for Plans Eliminated from Further Detailed Study (Plans 1 and 4)

Based on the District's consideration of the favorable and adverse aspects of the four structural plans studied in Stage 2, formal and informal discussions and written communications with the Ohio Department of Natural Resources and the U.S. Fish and Wildlife Service, and the requirements set forth in the National Environmental Policy Act and Executive Order 11990, the Buffalo District concluded that Alternative Plans 1 and 4 should be eliminated from further consideration as viable solutions for meeting the recreational boating and shore-based fishing needs in the project area. However, as a result of coordination of the Stage 2 Report (July 1979) with North Central Division and Office, Chief of Engineers, it was concluded that it would be appropriate to still carry Alternative Plans 1 and 4 forward into Stage 3 planning. These alternative plans would then be used as a basis for evaluating and assessing the effectiveness of the structural plans that warranted further detailed study (Alternative Plans 2 and 3) when addressing the functional and environmental concerns at Geneva State Park. In addition, for Plans 1 and 4 it was also concluded that no additional study, such as formulating mitigation plans, refining the alternatives based on input provided by local boaters, etc., would be required in Stage 3 planning with the exception of updating the cost estimate by price levels. Therefore, although Alternative Plans 1 and 4 were eliminated from further consideration as "Candidate Selected Plans" for meeting the recreational boating and shore-based fishing needs in the project area, they were still carried forward into Stage 3 planning and were used as the basis for evaluating and assessing the effectiveness of the structural plans that warranted further detailed study in addressing the functional and environmental concerns at Geneva State Park.

The rationale for eliminating Plans 1 and 4 from further consideration other than for comparative purposes with Plans 2 and 3 follows.

(1) Alternative Plan 1 (Cowles Creek Harbor) - The primary consideration in eliminating Plan 1 was the position stated by the Ohio Department of Natural Resources (ODNR) at the 29 May 1979 workshop (see paragraphs 15 and 16 of Exhibit F-4 in Appendix F) that they opposed this plan because it isolated the bathhouse and split their beaches. Although ODNR requested that their official position on all of the structural alternatives be deferred until they had an opportunity to study the plans in depth, it was apparent that they would not accept Plan 1 because of the adverse impact on other park facilities and uses. The Buffalo District recognized that the U.S. Fish and Wildlife Service preferred Plan 1 for several reasons and recommended that it be considered further (see Exhibits E-11 and E-12 of Appendix E). However, this plan was not considered viable because it was opposed by the local sponsor and therefore was not considered further.

(2) Alternative Plan 4 (Wetlands Harbor) - Plan 4 would destroy or disturb a major portion of the wetlands in the project area. Although this loss probably could be mitigated - at great expense - by artificially creating a wetland elsewhere, Executive Order 11990 dated 24 May 1977, prohibits Federal participation in projects which destroy wetlands if a practical alternative to such construction exists. Buffalo District concluded that, as

a minimum, Alternative Plan 2 was a practical alternative to Plan 4. Therefore, Plan 4 was eliminated from further consideration.

Rationale for Plans Warranting Further Detailed Study as Candidates for the Selected Plan (Plans 2, 3, and 5)

(1) Alternative Plan 2 (Offshore/Onshore Harbor) - The U.S. Fish and Wildlife Service, by letter dated 2 July 1979 (Exhibit E-11), recommended that Plan 2 be given serious consideration as a practical design subject to future refinement. The opportunity for breakwater fishing would be two to three times greater for Plan 2 than for the other plans because of the greater breakwater length. Plan 2 also maintained the integrity of the other park features and uses and was economically viable with a B/C Ratio of 1.38. For these reasons it was concluded that Plan 2 should be considered further.

(2) Alternative Plan 3 (Wetland/Parking Lot Harbor) - Plan 3 was considered to be a compromise between the environmental and functional concerns at Geneva State Park because it encroached into both the wetlands and parking area. Although the U.S. Fish and Wildlife Service recommended that Plan 3 be dropped from further consideration because there were practical alternatives involving lesser damage to the wetlands (see Exhibit E-11 of Appendix E), the amount of wetland destroyed would total only about 5 acres and could be mitigated, as necessary. In addition, of the practical alternatives to Plan 4 (the wetland plan), Plan 3 was the most economically efficient with estimated net benefits of $253,400 and a B/C Ratio of about 1.66. Plan 3, modified to provide either 300 or 360 slips, was preferred by ODNR. Based on sketches provided in a letter dated 17 July 1979 (see Exhibit E-13 of Appendix E), it was anticipated that the associated construction could be oriented to reduce the amount of wetland displaced. For these reasons, Plan 3 was considered further.

(3) Alternative Plan 5 (No-Action Plan) - As with any potential water resources project, the no-action or do-nothing plan was carried forward as an alternative course of action in the event that more detailed studies showed that structural and/or nonstructural plans could not be implemented because of the absence of engineering, economic, environmental, financial, social or political viability. Therefore, the no-action Plan 5 was considered further, and was used as the basis-of-comparison in evaluating the structural plans.

PLANS OF OTHERS

Local interests at Ashtabula Harbor, located 12 miles to the east, are actively pursuing similar small-boat harbor development at that location. The small-boat demand analysis performed for the Stage 2 study indicated that the total demand for the area was about 1,290 boats in 1990. With about 800 berthing spaces available at this time, the excess demand in the short-term would be 490 spaces. Therefore, it appeared that if the facility at Geneva State Park provided for 400 of these spaces, there would be very little need for other harbor facilities in the area.

Because of the apparent conflict between the proposed small-boat harbor project at Geneva State Park and the proposed development of similar facilities at Ashtabula Harbor, Buffalo District met with representatives of the Ashtabula County Commissioner's Office on 23 January 1981 (Exhibit E-9 in Appendix E includes minutes of this meeting). Based on discussions at this meeting, it was determined that the results of the Stage 2 small-boat demand analysis did not realistically reflect the demand for permanent berths on Lake Erie in Ashtabula County. The reason for this was that the Stage 2 analysis allocated to Pymatuning Reservoir, the only inland facility in Ashtabula County, approximately 40 percent of the total demand for berths by powerboats in Ashtabula County (total demand equals demand for berths along both Lake Erie and at inland facilities) and 15 percent of the total demand for berths by sailboats. However, as ascertained at the 23 January 1981 meeting with the Ashtabula County Commissioner's Office, Pymatuning Reservoir has a 10 horsepower motor limitation for powerboats and is unsuitable for sailboating except for small car-top type sailcraft. Thus, the Stage 2 allocation of demand between berths demanded on Lake Erie and berths demanded at inland facilities was not considered realistic.

Because the Stage 2 boating demand analysis did not realistically allocate demand for permanent berths between Lake Erie and inland facilities, the boating demand analysis was revised during Stage 3 planning. Based on the results of this revised analysis (see Table 2 in Section II of the Main Report and Appendix D, "Economic Evaluation") the demand for permanent berths on Lake Erie is 1,920 in 1990. With about 800 berthing spaces presently available, there is still sufficient demand to justify both the facility at Geneva State Park and at Ashtabula Harbor.

SECTION IV

ASSESSMENT AND EVALUATION OF DETAILED PLANS

Initially, a total of 11 structural and/or nonstructural plans were considered as possible solutions for meeting the small-boat navigation and recreational fishing needs at Geneva State Park. Of these 11 plans, seven were dropped from further consideration in the initial iteration, primarily because they did not satisfy the objective of providing an all-weather harbor at the site. Additional study of the remaining four alternatives during Stage 2 planning indicated that only two alternatives warranted further detailed study in Stage 3, due to economic (cost) and environmental considerations. These two alternatives are:

Alternative Plan No. 2 (Offshore/Onshore Harbor)
Alternative Plan No. 3 (Wetland/Parking Lot Harbor)

In addition, the basis of comparison for the above alternative plans is:

Alternative Plan No. 5 (No-Action (Do-Nothing) Plan))

This section provides a summary of the Stage 3 engineering design, economic evaluation, and environmental assessment associated with these two structural plans. Appendices A through D to this report provide additional details on the engineering and economic analyses. These appendices are:

Appendix A - Geology, Soils, and Construction Materials
Appendix B - Design and Coastal Processes
Appendix B1 - Hydrology and Hydraulic Design
Appendix C - Cost Estimates
Appendix D - Economic Evaluation

SUBSEQUENT ASSESSMENT AND EVALUATION OF PRELIMINARY PLANS RECOMMENDED FOR DETAILED STAGE 3 STUDY

At the beginning of Stage 3 planning, the Ohio Department of Natural Resources, the local sponsor for the project, and the U. S. Fish and Wildlife Service met in Columbus, Ohio, on 29 May 1980. The purpose of this meeting was to select a harbor alternative which they could recommend to the Corps for additional detailed study in Stage 3. The two plans under consideration at this meeting were Alternative Plan No. 2 (Offshore/Onshore Harbor) and Alternative Plan No. 3 (Wetland/Parking Lot Harbor).

Based on a careful analysis of these two alternative plans, it was the consensus of these two agencies that Alternative Plan No. 3, in either its original form as developed during Stage 2 planning, or as modified by ODNR in their letter of 17 July 1979 (Exhibit E-13 in Appendix E), should be recommended for additional detailed study and that Alternative Plan No. 2 should

be dropped from further consideration. The reasons for recommending Plan 3 were as follows:

(1) Because the offshore berthing area for Plan 2 would be a considerable distance from the existing parking lot (see Plate 13 in Appendix H), additional parking facilities would have to be constructed to the west of the existing wetland area for Plan 2. Thus, boating activities and development would be placed on three sides of the wetland area, rather than only one side, as was the case for Plan 3. The resulting secondary impacts to the wetland area (i.e., noise, disturbance through invasion of the area by people, etc.) would have, therefore, been much greater with Plan 2 than with Plan 3. In addition, it was anticipated that the amount of wetland directly destroyed by implementation of Plan 3 (approximately 5 acres) could be reduced to a comparable level with Plan 2 (approximately 2.6 acres) by reorienting the interior channel and mooring areas, especially with the reduction in mooring capacity, from 400 to either 300 or 360 berths, suggested by ODNR. Thus, it appeared that Plan 3, modified to reduce direct destruction of the wetland area, was more environmentally compatible with the wetland area than Plan 2.

(2) The second consideration in selecting Plan 3 for additional detailed study was cost consideration. The investment cost for Plan 2 (on October 1980 price levels) was $5,412,100 and annual charges were $462,300 (October 1980 price levels, 7-3/8 percent interest rate, and 50-year economic life). The investment cost for Plan 3 (on October 1980 price levels) was $4,530,400 and annual charges were $382,800 (October 1980 price levels, 7-3/8 percent interest rate, and 50-year economic life). Thus, the total investment cost for Plan 3 was $881,700 less than Plan 2 and annual charges were $79,500 less. In addition, since annual benefits for Plans 2 and 3 were identical ($636,200 on October 1980 price levels, 7-3/8 percent interest rate, and 50-year economic life), Plan 3 was also more economically efficient than Plan 2. (Note: Investment costs and annual charges for Plans 2 and 3 were based on May 1979 price levels and a 6-7/8 percent interest rate when the 29 May 1980 meeting was conducted. However, to avoid confusion to the reader of this report, prices were raised to October 1980 price levels and a 7-3/8 percent interest rate was used, consistent with the remainder of this report.)

Therefore, since Plan 3, modified to reduce direct destruction of the wetland area, was more environmentally compatible with the wetland area than Plan 2 and Plan 3 was more economically efficient, ODNR and the U. S. Fish and Wildlife Service agreed that Plan 3 should be recommended to the Corps for additional detailed study and Plan 2 should be eliminated from further consideration at the 29 May 1980 meeting. Buffalo District was also in agreement with this recommendation and thus Plan 3, modified to reduce destruction of the wetland area, was the only plan developed in detail and Plan 2 was eliminated from further consideration.

The results and recommendations of the 29 May 1980 meeting were transmitted to the Buffalo District office by ODNR by letter dated 29 May 1980 (Exhibit E-14 in Appendix E). Included in this letter was a request to meet with the Buffalo District at an early date so that final agreement could be reached on the alternative warranting additional detailed study in Stage 3.

As a result of this request, a workshop meeting was held on 26 June 1980 with the Buffalo District, ODNR, and the U. S. Fish and Wildlife Service. The purposes of this meeting were to select the version of Plan 3 which should be developed in detail during Stage 3 planning and to develop a conceptual mitigation plan for this alternative. The three versions of Plan 3 under consideration at this meeting are briefly reviewed below:

(1) Alternative Plan No. 3 (see Plate 14 in Appendix H) - Alternative Plan No. 3 consists of a breakwater protected entrance channel and an interior channel leading to a mooring area for 60 boats, and a second mooring area for 340 boats. The breakwaters were designed to limit wave heights to a maximum of 3 feet in the entrance channel and a maximum of 1 foot in the interior channels and mooring areas. The depth of the entrance channel is 8 feet below Low Water Datum (LWD), and the depth of the interior channel is 6 feet below LWD.

(2) Alternative Plan No. 3a (see Figure 6) - Alternative Plan 3a was originally suggested by ODNR in their letter of 17 July 1979 (Exhibit E-13) and consisted of a breakwater protected entrance channel similar to Plan 3 and an interior channel leading to a single mooring area for 300 boats. In addition, Plan 3a included a refuge area for small craft in the northwest corner of the marina and an additional temporary mooring area for trailered boats adjacent to the launching ramps. The depths of the entrance and interior channels were the same as for Plan No. 3.

(3) Alternative Plan No. 3b (see Figure 7) - Alternative Plan No. 3b was also suggested by ODNR and was similar to Plan 3a except that the mooring area was expanded to accommodate 360 boats instead of 300 boats. In addition, the service building and service area were relocated to the north, to coincide with the existing bathhouse.

Based on positions stated at this meeting by the meeting participants and other pertinent factors, Plan 3b was selected for additional detailed study and Plans 3 and 3a were eliminated from further consideration in addition to Plan 2, which was previously eliminated. Plan 3b was selected for additional detailed study primarily because it provided 60 additional berthing spaces when compared to Plan 3a; the 360-berth capacity was more compatible with ODNR's overall master plan for Geneva State Park when compared to Plan 3, which was formulated for 400 berths; Plan 3b would allow ODNR to convert their existing bathhouse into a dual purpose facility; Plan 3b would provide a designated refuge area for small craft which was not included in Plan 3; and Plan 3b, with one continuous mooring area, would be easier and less expensive to maintain than Plan 3, which had two separate mooring areas. Summary minutes of this meeting are provided as Exhibit F-5 in Appendix F.

STAGE 3 FORMULATION AND EVALUATION CRITERIA

Subsequent assessment and evaluation of plans recommended for additional detailed study at the conclusion of Stage 2 planning indicated that only Plan 3b (Modified Wetland/Parking Lot Harbor) should be carried forward into Stage 3 planning and that Plans 2, 3, and 3a should be eliminated from further consideration. Therefore, the emphasis in Stage 3 was limited to

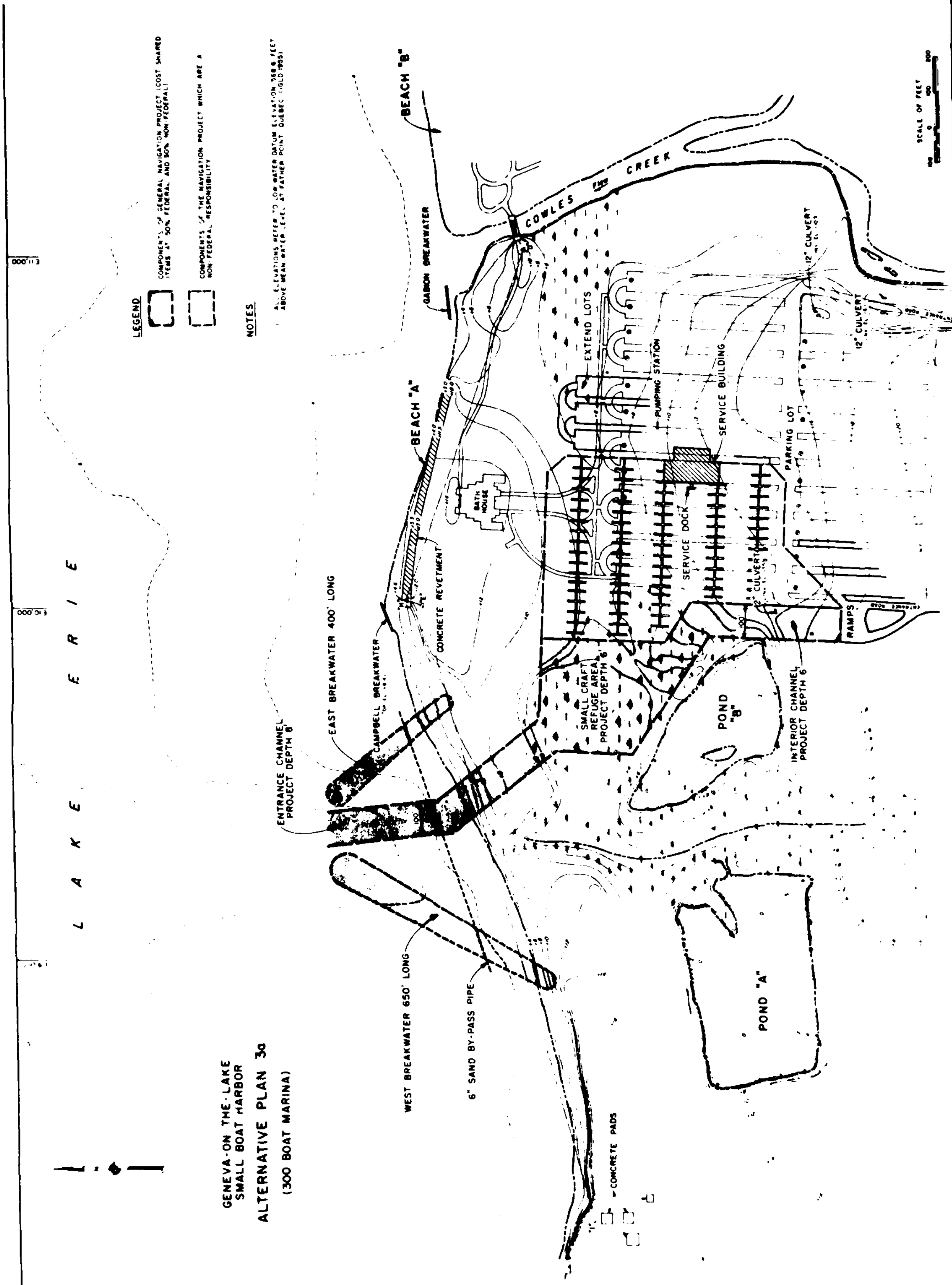
GENEVA-ON-THE-LAKE
SMALL BOAT HARBOR
ALTERNATIVE PLAN 3a
(300 BOAT MARINA)
LEGEND
COMPONENTS OF GENERAL NAVIGATION PROJECT (COST SHARED ITEMS AT 50% FEDERAL AND 50% NON-FEDERAL)
COMPONENTS OF THE NAVIGATION PROJECT WHICH ARE A NON-FEDERAL RESPONSIBILITY
NOTES
LAKE ERIE
BEACH "B"
BEACH "A"
COWLES CREEK
GABION BREAKWATER
EXTEND LOTS
PUMPING STATION
SERVICE BUILDING
PARKING LOT
12" CULVERT
BATH HOUSE
SERVICE DOCK
CULVERT
RAMPS
CONCRETE REVETMENT
EAST BREAKWATER 400' LONG
CAMPBELL BREAKWATER
ENTRANCE CHANNEL PROJECT DEPTH 8'
SMALL CRAFT REFUGE AREA PROJECT DEPTH 6'
INTERIOR CHANNEL PROJECT DEPTH 6'
POND "B"
POND "A"
WEST BREAKWATER 650' LONG
6" SAND BY-PASS PIPE
CONCRETE PADS
SCALE OF FEET

Figure 6

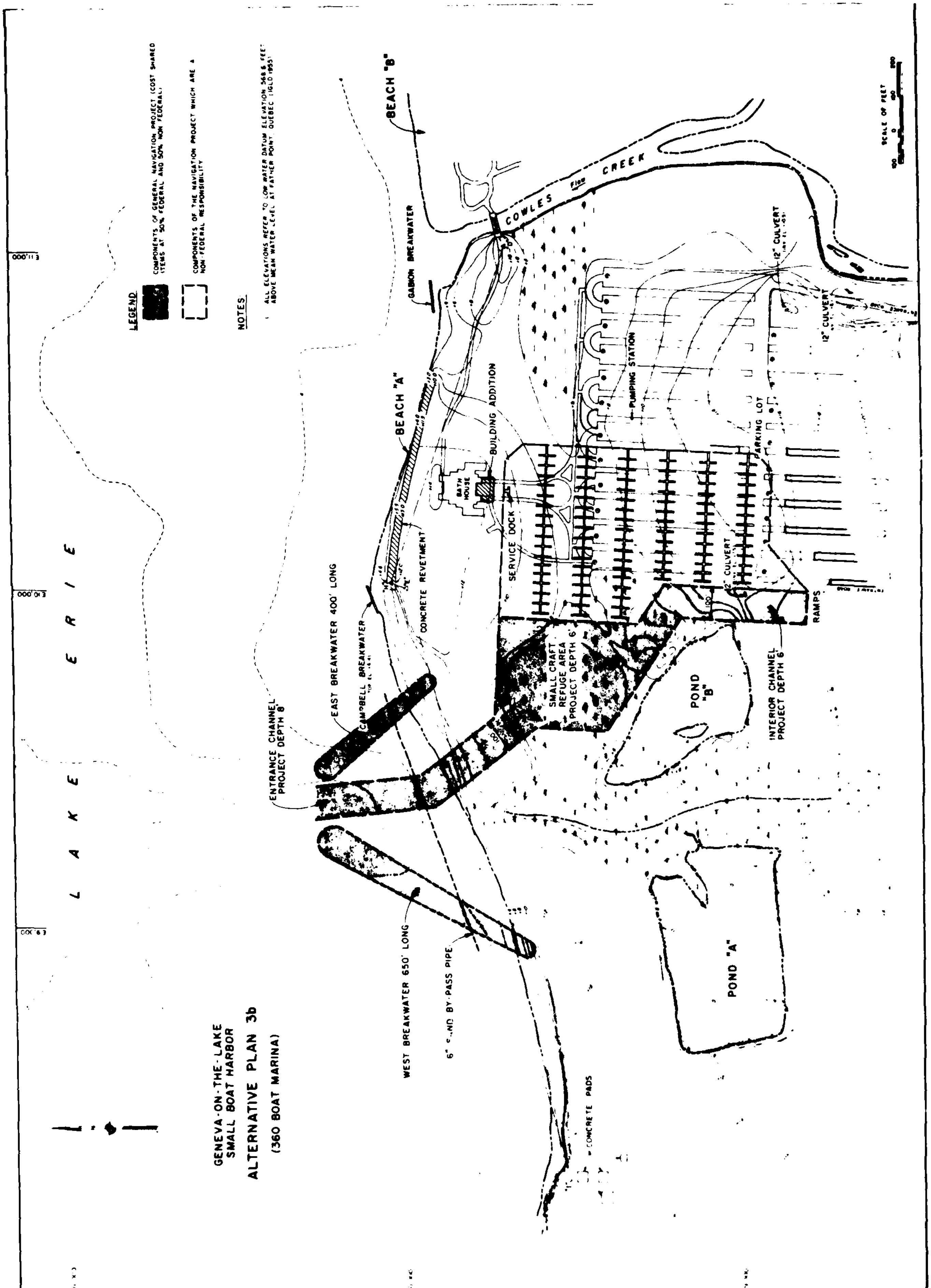
GENEVA-ON-THE-LAKE
SMALL BOAT HARBOR
ALTERNATIVE PLAN 3b
(360 BOAT MARINA)
LAKE ERIE
LEGEND
COMPONENTS OF GENERAL NAVIGATION PROJECT (COST SHARED ITEMS AT 50% FEDERAL AND 50% NON FEDERAL)
COMPONENTS OF THE NAVIGATION PROJECT WHICH ARE A NON-FEDERAL RESPONSIBILITY
NOTES
ALL ELEVATIONS REFER TO LOW WATER DATUM ELEVATION 568.6 FEET ABOVE MEAN WATER LEVEL AT FATHER POINT, QUEBEC (IGLD 1955)
BEACH "B"
COWLES CREEK
GABION BREAKWATER
BEACH "A"
BUILDING ADDITION
BATH HOUSE
PUMPING STATION
12" CULVERT
PARKING LOT
SERVICE DOCK
CONCRETE REVETMENT
EAST BREAKWATER 400' LONG
CAMPBELL BREAKWATER
ENTRANCE CHANNEL PROJECT DEPTH 8'
SMALL CRAFT REFUGE AREA PROJECT DEPTH 6'
RAMPS
POND "B"
INTERIOR CHANNEL PROJECT DEPTH 6'
WEST BREAKWATER 650' LONG
6" SAND BY-PASS PIPE
POND "A"
CONCRETE PADS
SCALE OF FEET

Figure 7

AD-A104 866 CORPS OF ENGINEERS BUFFALO NY BUFFALO DISTRICT F/G 13/2
GENEVA-ON-THE-LAKE, OHIO. SMALL-BOAT HARBOR. FINAL REFORMULATIO--ETC(U)
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refining Plan 3b. Principal considerations in this refinement were: the views of local boaters regarding channel depths, width, and aspect; mitigation of adverse environmental impacts; and modification of the configuration of the mooring area based on such factors as ODNR's preference for location of the launching ramps, service facilities and parking areas, and minimization of destruction of the existing wetland area.

The refinement of Plan 3b during Stage 3 planning was conducted in accordance with Federal policy on multiobjective planning as previously discussed in Section III of the Main Report. Within this overall planning framework, other more specific criteria relative to general policies, technical engineering, economic principles, social and environmental values, and local conditions were also established. These specific criteria, except as noted below, were identical to the criteria established during Stage 2 planning (discussed in Section III of the Main Report). The changes to Stage 2 criteria during Stage 3 planning are as follows:

Technical Criteria

a. A coincident 200-year design frequency, using either the 20-year recurrence significant deepwater wave height in combination with the 10-year lake level or the 10-year recurrence significant deepwater wave height in combination with the 20-year lake level for each season, whichever is more critical, should be used for design of structures. (Note: Lake level is defined as the mean lake level for Lake Erie which has either a 10-year or 20-year recurrence combined with a short-term peak rise which has a 1-year recurrence.)

b. The overflow section of the water control structure, a component of the mitigation plan for Plan 3b, will be sized to safely pass the peak 100-year flood discharge (800 cubic feet per second - see Appendix B1) without causing upstream flooding.

c. The stop-log opening of the water control structure will be sized to allow complete draining of the wetland area (from +6 LWD to +3 LWD) within a maximum of 1 week's time.

d. Foundations for the breakwaters are presumed to be sand or shales with bedrock at or near lake bottom.

Economic Criteria

No change from Stage 2 criteria.

Socio-economic and Environmental Criteria

No change from Stage 2 criteria.

Design and Other Considerations for Harbor and Marina Layout

Channels

Based on a workshop meeting with local boaters on 23 July 1980 (see Exhibit F-7 in Appendix F for summary minutes of this meeting), the Stage 2 criteria of an entrance channel depth of 8 feet below Low Water Datum, an interior channel depth of 6 feet below LWD and 100-foot wide channels were sufficient for the expected fleet at Geneva State Park.

Marina Requirements

For Stage 3 analysis, it was assumed that the marina should have a 360-slip capacity, as suggested by ODNR (the local sponsor), because it would have a less adverse effect on the wetland area and existing park facilities when compared to the larger 400-slip marina.

Support Facilities

For Stage 3, include six launching ramps and a public landing with service facilities in the project design.

Wave Requirements

No change from Stage 2 criteria.

Slope Protection

Vertical Walls - For Stage 3, a diaphram cell wall was assumed for costing purposes. (Note: The assumption of a diaphram cell wall, instead of a reinforced concrete "L" wall as selected in Stage 2, may be overly conservative. The diaphram cell wall was assumed because it can be constructed without dewatering the site. If soil analysis during the Phase II GDM study indicates that the site can be economically dewatered, as expected, a reinforced concrete "L" wall will be substituted for the diaphram cell wall resulting in a cost savings to the project.)

Excavated Material Disposal

No change from Stage 2 criteria.

Mitigation

The need for mitigation of adverse impacts on the wetland area is based upon the fact that wetlands are a scarce, fast disappearing resource along the highly industrialized eastern Ohio shoreline of Lake Erie. In addition, the project area supports several species of Ohio Threatened and Endangered species of plants and animals (see Table 1). The value and uniqueness of the wetland area within the project area is discussed in the U. S. Fish and Wildlife Service's four-season study report (Exhibit G-2 in Appendix G).

Cost-Sharing

Cost-sharing arrangements for mitigation of adverse environmental impacts were not included as items of local cooperation when the Geneva-on-the-Lake Small-Boat Harbor project was authorized for construction in 1970. However, since mitigation of adverse environmental impacts is required (primarily to offset impacts to the wetland area), and Congress has authorized project modifications for mitigation of adverse impacts to fish and wildlife resources under the Fish and Wildlife Coordination Act of 1958 (Public Law 85-624), appropriate cost-sharing arrangements will be added to the Congressionally authorized items of local cooperation. By letter dated 15 April 1981 (see Exhibit E-15 in Appendix E), ODNR, the local project sponsor, has indicated a willingness to provide this additional local cooperation, in addition to the items of local cooperation Congressionally authorized.

Based on a review of current Corps policy for mitigation of adverse environmental impacts, the following cost-sharing arrangements will be included as an item of local cooperation for this project:

a. Mitigation Features - First costs for mitigation features will be cost-shared 50 percent Federal and 50 percent non-Federal. Annual operation and maintenance costs would be 100 percent non-Federal.

ALTERNATIVE PLAN 3b - MODIFIED WETLAND/PARKING LOT HARBOR

Description of Plan 3b

Plan 3b would provide an all-weather, onshore harbor with a single berthing area for 360 boats on lands which are presently partly a wetland area and partly lawn and parking areas. The proposed plan is shown on Plate 16 in Appendix H.

The harbor entrance for Plan 3b would be located to take advantage of the existing rock trough and would be protected by an arrowhead breakwater system. Because of the trough, the breakwaters would be relatively short, aggregating about 1,050 feet. Both arms would be shore-connected to prevent shoaling of the navigation channel, to prevent adverse wave conditions in the harbor, and to provide access for fishing from the east breakwater. Because the west breakwater would be remote from existing parking and other park facilities (requiring that additional parking and an access road be constructed to the west and north of the existing wetland area), fishing facilities were not included on the west breakwater although a handrail has been added for safety considerations. A portable sand bypass system has also been incorporated into the project for down-drift nourishment. The portable system would utilize flexible, temporary pipe installed between the arms of the arrowhead breakwater during each bypassing operation in lieu of a permanent pipe system.

The entrance channel would be oriented in a south-southeasterly direction to bypass the mouth of the intermittent stream with the objective of minimizing the impact on the wetland area. The width of the entrance channel would be 100 feet, sufficient for two-way traffic, and the depth would be 8 feet below LWD.

The interior channel, leading to six launching ramps at the southwest corner of the marina, was located to limit encroachment into the wetlands. A levee would be constructed along the west perimeter of the channel to physically separate the wetlands from the marina. The harbor face of this levee would be riprapped to prevent erosion from prop wash and waves entering between the breakwaters. An impervious core would be incorporated into the levee in order to permit different water levels to be maintained in the wetlands and the marina.

A second interior channel was also included along the north side of the marina, at the request of the local sponsor. This second channel would provide access to the public wharf and fuel dock. A vertical diaphram cell wall would be constructed along the north perimeter to minimize loss of land in the vicinity of the existing bathhouse.

A small-craft refuge area has been included in Plan 3b, immediately south of the public wharf. This refuge area would provide shelter to small craft cruising along the south shore of Lake Erie who cannot safely reach their home ports during storm conditions. Small craft seeking shelter would have the option of either docking at the public wharf or anchoring in the designated refuge area without interfering with homecraft attempting to reach their berths.

The location of the mooring area, sized to accommodate 360 berths, was selected to minimize rock excavation and encroachment into the wetlands. The periphery would be protected against erosion from prop wash by vertical diaphram cell walls. The vertical walls would also minimize encroachment into the existing parking lot. Temporary mooring space would be provided at the southern end of the marina to accommodate trailer-drawn craft.

By letter dated 22 October 1980 (see Exhibit E-16 in Appendix E), ODNR has indicated that they intend to install floating docks in the mooring area, along with marina lighting for safety considerations. They may also provide electrical and water service to each dock, however, no final decision has been reached on this aspect. ODNR has also submitted a preliminary parking plan to accommodate both the marina activities and swimming activities at the park. However, modifications to this preliminary plan would probably be required to avoid encroachment into the wetland area bordering Cowles Creek.

Included in Plan 3b is a mitigation plan to compensate for adverse environmental impacts due to construction of the harbor plan. Components of this mitigation plan include the following:

a. Construction of a water control structure at the mouth of the intermittent stream that flows through the wetland area. The purpose of this structure would be to artificially regulate the water level in the wetland area, since the harbor plan would modify the natural processes responsible for maintaining the present levels. Various water levels (ranging from +3 to +6 LWD) would be maintained by removing or adding aluminum logs, to the desired height, at the stop-log opening. The water levels would be selected to encourage waterfowl production and to provide feeding and resting areas for spring and fall migrants. The water control structure would also have a 120-foot wide overflow section in order to safely pass the peak 100-year flood discharge.

b. To compensate for the loss of wetland areas excavated for the harbor plan, excavated material will be used to create new wetlands in Pond "A," on an acreage greater than that of the wetlands lost. The additional wetland habitat is required to offset secondary impacts to the remaining wetland area (from noise, invasion of the area by marina visitors, etc.). The additional wetland habitat is also required to insure that the existing amount of wildlife production in the area is maintained in the event that the habitat value of the created wetlands is less than the habitat value of the wetlands destroyed. The existing outlet for Pond "A" would be widened, to facilitate flushing of the new wetland area. In addition, the existing island in Pond "B" would be expanded to create additional habitat for waterfowl that provides a partial refuge from predators.

c. Planting of shrubs along the west wall of the marina and along the south perimeter of the wetland in order to provide a visual and auditory buffer between the wetland and the marina.

Cost Estimate for Plan 3b

The detailed cost estimate for Plan 3b is presented in Table C6 of Appendix C. The breakdown of the cost for lands and damages is shown in Table C1 of Appendix C, and the annual charges are summarized in Table C11.

Tables 20 and 21 following, summarize the estimated project costs and annual charges and provide a breakdown of the Federal and non-Federal share of these costs for Plan 3b. From these tabulations, it is seen that the total project cost, including $310,000 for mitigation of adverse environmental impacts, is $5,834,000 (Table 20), the total investment cost, including interest during construction, is $6,228,600 (Table 21), and total annual charges are $573,200. Table 21 also includes cost allocation by project purpose.

Economic Evaluation of Plan 3b

The detailed discussion on the projected benefits that would be realized from implementation of Plan 3b is presented in Appendix D - "Economic Evaluation." Benefit categories investigated include: (1) recreational navigation benefits; (2) harbor-of-refuge benefits; and (3) recreational fishing benefits. From Table D22 in Appendix D, the total average annual navigation benefits (including harbor-of-refuge benefits) are $846,200 and recreational fishing benefits are $26,600.

Table 22, following, summarizes the average annual charges, average annual benefits, net average annual benefits, and the benefit-cost ratios for Plan 3b, by project purpose. As indicated, net average annual benefits are $280,800 and the benefit-cost ratio is 1.50 for navigation and net benefits are $18,800 and the benefit-cost ratio is 3.41 for recreational fishing. The total project is justified, with net average annual benefits of $299,600 and a benefit-cost ratio of 1.52.

Environmental Features/Assessment of Plan 3b

Construction of a small-boat harbor at this site would place the facility in a sheltered position with respect to storm and wave activity. The accretion and erosion mechanism in the immediate vicinity would be altered, however, a

Table 20 - Estimate of Total Project Cost for Alternative Plan 3b and Federal and Non-Federal Share (October 1980 Price Levels)

Item	Amount	Total
	$	$
TOTAL PROJECT COSTS:		
1. Channels	3,143,000	
2. Breakwaters	888,000	
3. Recreational Facilities	56,000 1/	
4. Aids to Navigation	70,000 2/	
5. Lands and Damages	484,000	
6. Engineering and Design	850,000 3/	
7. Supervision and Administration	343,000	
Total Project Cost		5,834,000 4/
FEDERAL SHARE:		
50 percent of Items 1, 2, 3, 6, and 7	2,640,000	
Aids to Navigation (U. S. Coast Guard)	70,000	
Total Federal Share of Project Cost		2,710,000
NON-FEDERAL SHARE:		
Cash Contribution (50 percent of Items 1, 2, 3, 4, 6, and 7)	2,640,000	
Lands and Damages	484,000	
Total Non-Federal Share of Project Cost		3,124,000 5/

1/ To provide walkway and handrail on east breakwater for breakwater fishing.

2/ Cost includes necessary Engineering and Design and Supervision and Administration.

3/ Includes $124,000 for hydraulic model study.

4/ Includes $310,000 for mitigation of adverse environmental impacts.

5/ Does not include costs for self-liquidating features of the project, such as dredging of mooring areas and construction of docks, launching ramps, and public service facilities. The estimated non-Federal cost for these self-liquidating features is $5,920,000 (October 1980 price levels).

Table 21 - Estimated Investment Cost and Annual Charges for Alternative Plan 3b (October 1980 Price Levels) 1/

Item	Navigation	Recreation	Total
	$	$	$
TOTAL INVESTMENT FOR THE PROJECT:			
Total Project Cost, Excluding Lands 2/	5,278,000	72,000	5,350,000
Interest During Construction	389,200	5,400	394,600
Lands and Damages	484,000	0	484,000
Total Investment, Including Lands	6,151,200	77,400	6,228,600
ANNUAL CHARGES FOR THE PROJECT:			
Interest	453,600	5,800	459,400
Amortization	13,300	200	13,500
Maintenance	98,500	1,800	100,300
Total Annual Charges	565,400	7,800	573,200
FEDERAL SHARE:			
Total Investment Cost			
Total Project Cost	2,674,000	36,000	2,710,000
Interest During Construction	197,200	2,700	199,900
Total Investment	2,871,200	38,700	2,909,900
Annual Charges			
Interest	211,700	2,900	214,600
Amortization	6,200	100	6,300
Maintenance	92,600 3/	0	92,600
Total Annual Charges	310,500	3,000	313,500
NON-FEDERAL SHARE:			
Total Investment Cost, Including Lands			
Total Project Cost, Excluding Lands	2,604,000	36,000	2,640,000
Interest During Construction	192,000	2,700	194,700
Lands and Damages	484,000	0	484,000
Total Investment, Including Lands	3,280,000 4/	38,700	3,318,700
Annual Charges			
Interest	241,900	2,900	244,800
Amortization	7,100	100	7,200
Maintenance	5,900 5/	1,800 6/	7,700
Total Annual Charges	254,900	4,800	259,700

1/ 7-3/8 percent interest rate, 50-year life (i = .07375, amort. = .00216).
2/ Includes cost for mitigation of adverse environmental impacts.
3/ 100 percent Federal for general navigation.
4/ Excludes $5.92 million for self-liquidating costs.
5/ 100 percent non-Federal for mitigation.
6/ 100 percent non-Federal.

Table 22 - Summary of Benefits and Costs for Plan 3b
(October 1980 Price Levels)

	Navigation	Recreational Fishing	Total Project
	$	$	$
Average Annual Benefit	846,200	26,600	872,800
Average Annual Cost			
Federal	310,500	3,000	313,500
Non-Federal	254,900	4,800	259,700
Total	565,400	7,800	573,200
Net Benefits	280,800	18,800	299,600
Benefit-Cost Ratio	1.50	3.41	1.52

portable sand bypass system would be utilized to nourish downdrift areas. The plan would require that 800 feet of shoreline be enclosed by breakwaters. The underwater surface area of these breakwaters, which would directly and indirectly benefit fisheries, would provide approximately 0.6 acre of colonizable benthic habitat. Fishing access will be provided on the east breakwater. The small-boat harbor would occupy roughly 15 acres inland near the shore. This area includes 4.4 acres which are in a fairly natural state, including 2.3 acres of wetlands which would be lost. The irreversible alteration of aesthetic characteristics of the shoreline and the irretrievable expenditure of materials, labor, and energy to the construction and maintenance of the project also represent a significant commitment of resources.

The plan would initially cause a considerable amount of irreversible wetlands destruction. The harbor is planned to be situated on an area which includes 2.3 acres of wet meadow, shallow marsh, and deep marsh combined. (There is a total of 6.6 acres of wet meadow and marsh in the immediate vicinity of the proposed project; this herbaceous wetland is part of a marsh/swamp complex of roughly 9.6 acres). The completed harbor would be located contiguous to the remaining wetland area. Mitigation, through replacement in kind, by creating wetland conditions on an acreage greater than that of the wetlands lost by harbor construction, is planned for the project. This includes: (1) placement of excavated material in an existing, somewhat deep, sparsely vegetated borrow pit to create an area with innundation characteristics which would be conducive to the establishment of abundant wetland plant life; (2) enlargement, using excavated material, of an existing island in a second borrow pit, to favor the establishment of nesting waterfowl there; (3) construction of a water level control device and establishment of a program to regulate water levels in the entire marsh/swamp complex to maintain wetland environmental conditions; and (4) planting of a shrub barrier between the boat harbor and the wetlands. The result of these environmental mitigation measures would be that the amount of wetlands-related fish and wildlife resources in existence at Geneva State Park under post-project conditions would equal or exceed that which currently exists.

Implementation of Plan 3b

Plan 3b is economically justified and is environmentally viable. It is the only plan that is acceptable to both ODNR, the local sponsor, and the U. S. Fish and Wildlife Service. Plan 3b is also acceptable to the local boating community. In addition, since the wetlands destroyed by Plan 3b would be replaced in kind, Plan 3b is in compliance with Executive Order 11990 (Protection of Wetlands).

It is, therefore, concluded that Plan 3b can be implemented, and is, in fact, the only plan supported by all study participants and local interests.

ALTERNATIVE PLAN 5 - NO-ACTION

The "No-Action" or "Do-Nothing" Plan represents the base condition for evaluation of Plan 3b previously described. This option, although not favored by local project sponsors and the recreational boating community, avoids both

the monetary investments and potential adverse impacts associated with structural improvements. The plan would not meet any of the needs of boaters or recreational fishermen in the area. It would not provide a harbor-of-refuge for pleasure craft along a relatively long, unprotected reach of Lake Erie shoreline that presently has no such facilities. Problems stated earlier in this report would remain unchanged. The "No-Action" Plan would not meet the planning objective to provide a safe, all-weather small-boat facility in the study area. However, Plan 5 would, at least temporarily, assure the preservation of the wetland area that would be disturbed or destroyed by construction of a small-boat harbor at Geneva State Park.

SECTION V

COMPARISON OF DETAILED PLANS

Subsequent assessment and evaluation of plans recommended for additional detailed study at the conclusion of Stage 2 planning indicated that only Plan 3b (Modified Wetland/Parking Lot Harbor) should be developed in detail during Stage 3 planning and that Plans 2, 3, and 3a should be eliminated from further consideration. In addition, the basis of comparison for Plan 3b was Plan 5 (No-Action (Do-Nothing) Plan). This section compares the impacts of Plan 3b with the impacts of Plan 5 and discusses the rationale for designating a NED plan, an EQ plan, and the selected plan. The section then concludes with a comparison of the selected plan and Plans 1 and 4, eliminated from further consideration at the conclusion of Stage 2 planning.

COMPARISON OF DETAILED PLANS

Table 23, following, compares the impacts of Alternative Plan 3b (Modified Wetland/Parking Lot Harbor) and Alternative Plan 5 (No-Action (Do-Nothing) Plan). Impacts are measured and the results displayed or accounted for in terms of contributions to four accounts: National Economic Development (NED); Environmental Quality (EQ); Regional Economic Development (RED), and Other Social Effects (OSE).

Table 23 - Summary of Effects for Alternative Plans 3b and 5

	Alternatives	
	Plan 3b Modified Wetland/ Parking Lot Harbor	Plan 5 No-Action
A. Plan Description	360-berth all-weather onshore facility on lands which are presently partly a wetland area and partly lawn and parking areas. Provides for breakwater fishing from east breakwater.	Do-Nothing
B. Significant Impacts		
1. National Economic Development		
a. Beneficial Impacts		
(1) Annual Navigation Benefits	$846,200	None
(2) Annual Recreational Fishing Benefits	$26,600	None
b. Adverse Impacts		
(1) Total Project Investment Cost 1/	$6,228,600	None
(2) Self-Liquidating Cost 2/	$5,920,000	None
(3) Annual Charges for Navigation	$565,400	None
(4) Annual Charges for Recreational Fishing	$7,800	None
c. Economic Efficiency		
(1) Navigation		
(a) Net Benefits	$280,800	None
(b) B/C Ratio	1.50	
(2) Recreational Fishing		
(a) Net Benefits	$18,800	None
(b) B/C Ratio	3.41	

Table 23 - Summary of Effects for Alternative Plans 3b and 5 (Cont'd)

	Alternatives	
	Plan 3b Modified Wetland/ Parking Lot Harbor	Plan 5 No-Action
(3) Total Project		
(a) Net Benefits	$299,600	None
(b) B/C Ratio	1.52	
2. <u>Environmental Quality</u>		
a. *Beneficial Impacts*		
(1) Colonizable benthic habitat created. (Surface area of breakwater system below average lake level.)	0.6 acre	None
(2) Wildlife habitat created.	Conversion of 5-acre pond (Pond "A") into wetland. Enlargement of existing island in Pond "B".	None
b. *Adverse Impacts*		
(1) Wildlife habitat destroyed.	Destruction of 4.4 acres currently in a fairly natural state, including 2.3 acres of wetlands. Enclosure by breakwater of 800 feet of shoreline. Harbor may create disturbances which would eliminate wood duck roosting.	None
(2) Fisheries destroyed.	Elimination of small recreational panfish fishery in Pond "A".	None
(3) Water Quality	Short-term impacts during construction, including increased turpidity and possibility of oil and gasoline spills. Long-term impacts from marina activities, including possibility of oil and gasoline spills.	None

Table 23 - Summary of Effects for Alternative Plans 3b and 5 (Cont'd)

	Alternatives	
	Plan 3b Modified Wetland/ Parking Lot Harbor	Plan 5 No-Action
(4) Air Quality	Temporary increases in dust, odors, and vehicle emissions during construction. Increases in odors and vehicle emissions from mooring activities.	None
3. <u>Regional Economic Development</u>		
a. Beneficial Impacts		
(1) Property Values	Increase in commercial property market values.	None
(2) Tax Revenues	Increase in property tax revenues consistent with property value increase. Increase in sales tax revenues as boating and recreation-related sales increase.	None
(3) Employment/Labor Force	Temporary increase during construction. Long-term increase associated with marina operation and sale of appurtenent goods and services.	None
(4) Regional Growth	Amenable to desired regional growth.	None
(5) Business and Industrial Activity	Increase in tourist-related business activity and industrial activity related to boating.	None
b. Adverse Impacts		
(1) Public Services and Facilities	Public services, such as refuse collection, sewage treatment, water supply, and public utilities expanded somewhat to service marina users, particularly during the boating season.	None

Table 23 - Summary of Effects for Alternative Plans 3b and 5 (Cont'd)

	Alternatives	
	Plan 3b Modified Wetland/ Parking Lot Harbor	Plan 5 No-Action
4. Other Social Effects		
a. Beneficial Impacts		
(1) Community Cohesion	None	None
(2) Community Growth	None	None
(3) Cultural Resources	None	None
(4) Displacement of Farms	None	None
(5) Recreational and Educational Opportunities	Increased recreation from boating and fishing.	None
(6) Enhancement of Health, Safety, and Community Well-Being	Significant increase in safety from harbor-of-refuge.	None
b. Adverse Impacts		
(1) Community Cohesion	None	None
(2) Community Growth	None	None
(3) Cultural Resources	None	None
(4) Displacement of Farms	None	None
(5) Recreational and Educational Opportunities	Limited degradation of such activities as birdwatching, etc., due to boating activities nearby. Destruction of 25 percent of existing bathhouse parking.	None
(6) Enhancement of Health, Safety, and Community Well-Being	None.	No harbor-of-refuge for pleasure craft
(7) Noise	Temporary noise pollution during construction. Noise pollution throughout project.	None
(8) Displacement of People	Temporary displacement of bathers during construction.	None

Table 23 - Summary of Effects for Alternative Plans 3b and 5 (Cont'd)

	Alternatives	
	Plan 3b Modified Wetland/ Parking Lot Harbor	Plan 5 No-Action
(9) Aesthetics	Temporary obstruction to the natural view of the lake and detraction from the scenic beauty of the shoreline during construction. Breakwaters would obstruct view of shore-line.	None
c. Public and Agency Acceptability	Acceptable to USF&WLS, Ohio Department of Natural Resources, and local boating community.	Unaccept-able to the State of Ohio and boating community

1/ Includes costs of lands and damages and interest during construction.

2/ Includes estimated costs for excavating mooring area, docks for 360 berths, public service facilities, and six launching ramps. Since these costs are considered self-liquidating, they are not included as part of the total project investment in determining the economic feasibility of the project.

RATIONALE FOR DESIGNATION OF NED PLAN

In selecting the National Economic Development (NED) Plan, candidate plans must not only satisfy the planning objectives and evaluation criteria, they must also maximize net benefits. Based solely on an evaluation of plans developed during Stage 3 planning (Plans 3b and 5), Plan 3b is the NED Plan because it is the only plan that satisfies the planning objectives and provides net positive benefits ($299,600 annually). However, it is also postulated that if Plans No. 1 (Cowles Creek Harbor), No. 2 (Offshore/Onshore Harbor), and No. 4 (Wetlands Harbor) were developed to the same level of refinement as Plan 3b, Plan 3b would continue to be the NED Plan. This assumption is based on the following rationale:

a. Plan 3b is a result of modifications to Plan 3, originally developed during Stage 2 planning. These modifications included such items as reducing the capacity of the mooring basin from 400-slips to 360-slips; increasing the number of launching ramps from two ramps to six ramps; modifying the configuration of the marina to minimize impacts to the wetland area; including a small-craft refuge area as a plan component; separating the launching ramp activities from the fueling facilities, thereby requiring separate interior channels; substituting, for cost estimating purposes, a diaphram cell wall for the reinforced concrete "L" wall; and including a mitigation plan to compensate for unavoidable adverse environmental impacts. These modifications resulted in an increase in the total investment cost for the harbor plan of approximately 38 percent (from $4,530,400 (total investment cost for Plan 3, see Table 13) to $6,228,600 (total investment cost for Plan 3b, see Table 21)). Since similar modifications would have been required for Plans 1, 2, and 4, their investment costs would have also undergone a similar increase of 38 percent. Increasing the original (Stage 2) investment costs for Plans 1, 2, and 4 by 38 percent results in the following updated costs: Plan 1 - $8,109,600 ($5,876,500 X 1.38 (see Table 7)); Plan 2 - $7,468,700 ($5,412,100 X 1.38 (see Table 10)); and Plan 4 - $5,088,060 ($3,687,000 X 1.38 (see Table 16)). In addition, since Plan 4 (Wetlands Harbor) would have destroyed the entire value of the wetland area, an additional cost would have been incurred to provide additional mitigation features, if mitigation was possible. Although no mitigation plan was developed for Plan 4, a conservative assumption would be that the cost for these additional mitigation features would, as a minimum, be in direct proportion to the amount of wetlands destroyed. Therefore, since the cost to mitigate destruction of one-fourth of the wetlands was $310,000 (mitigation cost for Plan 3b), the additional mitigation cost for Plan 4 would have been at least $1,240,000 (4 X $310,000). Combining the updated cost for Plan 4 ($5,088,600) with the additional cost for mitigation ($1,240,000) yields a total investment cost of $6,328,600 for Plan 4.

b. The navigation benefits for the project are independent of the plan under consideration, provided that each plan includes the same number of permanent slips (360) and launching ramps (six). Recreational fishing benefits will vary for each plan based on the total length of breakwater available for fishing, however, this difference would be minor in comparison to the total project benefits and can be neglected for this evaluation. Thus, the total project benefits would be the same for all plans.

c. Since the total project benefits are the same for all plans, the NED plan would be the plan with the lowest total investment cost (ignoring annual operation and maintenance costs which are similar for all plans). Thus, Plan 3b, with a total investment cost of $6,228,600, would still be the NED Plan.

RATIONALE FOR DESIGNATION OF EQ PLAN

Recognizing that environmental quality (EQ) has both natural and human manifestations, an EQ Plan addresses the planning objectives in the way which emphasizes aesthetic, ecological, and cultural contributions. Beneficial EQ contributions are made by preserving, maintaining, restoring, or enhancing the significant cultural and natural environmental attributes of the study area. Designating an EQ Plan involves measuring the environmental changes related to different plans and selecting the plan which, based on public input, contributes to, or is most harmonious with, environmental objectives. The fundamental environmental objective in the Geneva-on-the-Lake study is to minimize or eliminate any adverse environmental impacts resulting from the project on the wetland area.

Candidate EQ Plans must make net positive contributions to the components of the EQ account. As a minimum, an alternative must make net positive contributions to the EQ account in order to be designated the EQ Plan. If it is impossible to develop a plan which meets these minimum requirements, an EQ Plan cannot be designated. Rather, the plan which is least damaging to the environment will be identified. Because there was no specific opportunity to improve the environment at Geneva State Park nor was there any identified need, no positive EQ objectives were developed for the Geneva-on-the-Lake Phase I study although one study objective was developed with the purpose of minimizing or avoiding adverse impacts to the wetland area. Therefore, no study plan provided net contributions to the EQ account. All plans, including Plan 3b, cause initial wetland destruction by locating harbor facilities, in part, on currently existing wetlands. For Plan 3b, this destruction would be compensated for by implementation of specific environmental mitigation measures. These measures would offset specific negative environmental impacts, but would not result in net environmental benefits. Also, all alternatives would cause some negative environmental effects which mitigation would not compensate for. The plan which would result in minimal impact is Alternative Plan 3b, the Modified Wetland/Parking Lot Plan, including environmental mitigation which, therefore, is designated as the plan which is least damaging to the environment.

RATIONALE FOR SELECTED ALTERNATIVE (PLAN 3b)

Alternative Plan 3b is economically justified and environmentally viable. It is both the NED Plan and the plan least damaging to the environment (an EQ Plan could not be designated for this study since no alternative provided net contributions to the EQ account). Plan 3b is the only plan acceptable to both the Ohio Department of Natural Resources, the local sponsor, and the U. S. Fish and Wildlife Service. Plan 3b is also acceptable to the local boating community. In addition, since wetlands destroyed by Plan 3b would be replaced in kind, Plan 3b is in compliance with Executive Order 11990 (Protection of Wetlands). For these reasons, Alternative Plan 3b (Modified Wetland/Parking Lot Harbor) is the selected alternative.

COMPARISON OF SELECTED ALTERNATIVE WITH PLANS 1 AND 4

At the suggestion of higher Corps authority (North Central Division and Office, Chief of Engineers), the alternative harbor plan selected for additional detailed study in Stage 3, Alternative Plan 3b, was compared with Alternative Plans 1 and 4, which were eliminated from further consideration at the conclusion of Stage 2 planning. The purpose of this comparison was to assess the environmental effectiveness of Plan 3b as compared to Plan 1 (which was formulated to address the environmental concerns at Geneva State Park without consideration of adverse impacts to existing park facilities) and to assess the functional performance of Plan 3b as compared to Plan 4 (which was formulated to address the functional concerns at Geneva State Park without consideration of adverse environmental impacts). A discussion of these comparisons is provided below.

Environmental Comparison of Plan 3b with Plan 1

Alternative Plan No. 1 (Cowles Creek Harbor) would provide an all-weather inland harbor near the mouth of Cowles Creek. The layout and project features for Plan 1 are shown on Plate 12 in Appendix H.

Plan 1, originally suggested by the U. S. Fish and Wildlife Service, addressed the environmental concerns at Geneva State Park without consideration of adverse impacts to existing park facilities and was formulated to minimize impact to the wetland area. However, with due consideration to other planning constraints under which all alternatives were formulated (i.e., bedrock profile, areas available in the park for a small-boat harbor, etc.), the harbor plan would destroy approximately 0.9 acre of a second wetland area located to the west of Cowles Creek (subsequently revised to 1.8 acres based on the redefined wetland boundries as presented in the U. S. Fish and Wildlife Service's Four-Season Study, see Plate 9 in Appendix H). The wetland area to the west of the parking lot (the wetland area of primary concern at Geneva State Park) would also be vulnerable to secondary impacts resulting from increased boat traffic. In addition, the aquatic ecosystem of Cowles Creek would be adversly affected by implementation of Plan 1.

Plan 3b, the selected plan, would initially cause destruction of approximately 2.3 acres of wetland and the completed harbor would be located contiguous to the remaining wetland area. However, a specific mitigation plan has been formulated to offset these environmental impacts with the result that the amount of wetlands-related fish and wildlife resources in existence at Geneva State Park under post-project conditions would equal or exceed that which currently exists. Thus, although Plan 3b would not enhance the natural environment at Geneva State Park, the plan would have minimal net impact on the environment and is the plan least damaging to the environment when compared to all plans considered in this Phase I study.

Functional Comparison of Plan 3b with Plan 4

Alternative Plan No. 4 (Wetlands Harbor) would provide an all-weather inland harbor in the wetland area to the west of the existing parking lot. The layout and project features of Plan 4 are shown on Plate 15 in Appendix H.

Plan 4, originally suggested by the Ohio Department of Natural Resources, addressed the functional concerns at Geneva State Park without consideration of adverse environmental impacts and was formulated to minimize impacts to the existing and future park development (see Plate 2 in Appendix H which outlines ODNR's master plan for Geneva State Park). Thus, with due consideration to other planning constraints under which all alternatives were formulated, the harbor was situated in the existing wetland area to the west of the parking lot, and disruption to existing park facilities was avoided.

Plan 3b, the selected plan, would initially cause destruction of approximately 25 percent of the existing parking lot and would restrict access to the bathhouse from the west and south. The plan would, however, increase the usefulness of the existing bathhouse since the bathhouse would be converted into a dual purpose facility serving both swimming and boating activities at the park. In addition, an economic cost has been charged against Plan 3b to account for the parking lot destruction and the reduced bathhouse access. As previously discussed, it is postulated that the total investment cost for Plan 3b ($6,228,600) would be less than the total investment cost required for Plan 4, if the cost to mitigate adverse environmental impacts of Plan 4 was included. Therefore, although Plan 3b causes more disruption of existing park facilities when compared to Plan 4, it is more cost effective to replace the parking facilities and accept the depreciated value of the bathhouse due to reduced access than to construct features to mitigate adverse environmental impacts of Plan 4.

SECTION VI

CONCLUSIONS

The primary purpose of this section is to provide a summary of the significant conclusions of this Phase I study. The section also provides an updated cost estimate and economic evaluation for Alternative Plan 3b, the selected plan.

CONCLUSIONS

Geneva State Park is a multi-use recreational complex that provides, or will provide, opportunities for picnicking, camping, swimming, boating, fishing, and hiking. The primary water resources needs for which a solution is sought under this authority is provision of facilities for recreational navigation and shore-based fishing. As possible solutions to addressing these primary needs, an array of 10 structural solutions and one nonstructural solution, in addition to the "no-action" option, were initially identified. Of these 11 structural and/or nonstuctural plans, seven were dropped from further consideration in the initial iteration, primarily because they did not satisfy the planning objective of providing an all-weather harbor at the site. Additional study of the remaining four alternatives during Stage 2 planning and subsequent assessment and evaluation at the beginning of Stage 3, indicated that only one alternative plan, Plan 3b (Modified Wetland/Parking Lot Harbor), warranted additional detailed study due to economic (cost) and environmental considerations. In addition, the basis of comparison for Plan 3b was the "no-action" (do-nothing) plan.

The emphasis in Stage 3 planning was therefore limited to refining Plan 3b. Principal considerations in this refinement were: the views of local boaters regarding channel depths, width, and aspect; mitigation of adverse environmental impacts; and modification of the configuration of the mooring area based on such factors as ODNR's preference for location of the launching ramps, service facilities and parking areas, and minimization of destruction of the existing wetland area. Following completion of this refinement, the impacts of Plan 3b were then compared to the impacts of the "no-action" (do-nothing) plan.

Based on the results of the Stage 3 planning effort, it has been determined that Alternative Plan 3b is economically justified and environmentally viable. It is both the NED Plan and the plan least damaging to the environment (an EQ Plan could not be designated for this study since no alternative provided net contributions to the EQ account). Plan 3b is the only plan acceptable to both the Ohio Department of Natural Resources, the local sponsor, and the U. S. Fish and Wildlife Service. Plan 3b is also acceptable to the local boating community. In addition, since wetlands destroyed by Plan 3b would be replaced in kind, Plan 3b is in compliance with Executive Order 11990 (Protection of Wetlands). For these reasons, it is the conclusion of this Reformulation Phase I Study that Alternative Plan 3b (Modified Wetland/Parking Lot Harbor) should be recommended for construction.

Plan 3b would provide an all-weather, onshore harbor with a single berthing area for 360 boats on lands which are presently partly a wetland area and

partly lawn and parking areas. Components of the Federal project, shown on Plate 16 in Appendix H, include the following:

a. Breakwaters in Lake Erie aggregating about 1,050 feet in length;

b. An 800-foot long entrance channel, 100-feet wide and 8-feet deep;

c. Interior channels totally about 1,700-feet in length, 100-feet wide and 6-feet deep;

d. A small-craft refuge area totalling about 0.9 acres in size;

e. A mitigation plan, including a water control structure, creation of about 5 acres of new wetlands and expansion of an existing island to favor the establishment of waterfowl; and

f. Development of related recreational fishing facilities.

UPDATE OF COST ESTIMATE AND ECONOMIC EVALUATION

The original cost estimate and economic evaluation for Plan 3b (Modified Wetland/Parking Lot Harbor) were based on October 1980 price levels which have become somewhat dated. Therefore, the purpose of this paragraph is to present an updated cost estimate and economic evaluation, on August 1981 price levels, for the selected plan. Additional details on the updated cost estimate and economic evaluation are presented in Appendix C ("Cost Estimates") and Appendix D ("Economic Evaluation"), respectively.

Tables 24 and 25 following, summarize the estimated project costs and annual charges and provide a breakdown of the Federal and non-Federal share of these costs for Plan 3b. From these tabulations, it is seen that the total project cost, including $332,000 for mitigation of adverse environmental impacts, is $6,309,000 (Table 24), the total investment cost, including interest during construction, is $6,738,000 (Table 25) and total annual charges are $620,600. Table 25 also includes cost allocation by project purpose.

Table 26 summarizes the average annual charges, average annual benefits, net average annual benefits and the benefit-cost ratios for Plan 3b by project purpose. As indicated, net average annual benefits are $284,000 and the benefit-cost ratio is 1.46 for navigation and net benefits are $19,600 and the benefit-cost ratio is 3.28 for recreational fishing. The total project is justified, with net average annual benefits of $303,600 and a benefit-cost ratio of 1.49.

Table 24 - Estimate of Total Project Cost for Alternative Plan 3b and Federal and Non-Federal Share (August 1981 Price Levels)

Item	Amount	Total
	$	$
TOTAL PROJECT COSTS:		
1. Channels	3,426,000	
2. Breakwaters	956,000	
3. Recreational Facilities	61,000 1/	
4. Aids to Navigation	76,000 2/	
5. Lands and Damages	493,000	
6. Engineering and Design	914,000 3/	
7. Supervision and Administration	383,000	
Total Project Cost		6,309,000 4/
FEDERAL SHARE:		
50 percent of Items 1, 2, 3, 6, and 7	2,870,000	
Aids to Navigation (U. S. Coast Guard)	76,000	
Total Federal Share of Project Cost		2,946,000
NON-FEDERAL SHARE:		
Cash Contribution (50 percent of Items 1, 2, 3, 4, 6, and 7)	2,870,000	
Lands and Damages	493,000	
Total Non-Federal Share of Project Cost		3,363,000 5/

1/ To provide walkway and handrail on east breakwater for breakwater fishing.

2/ Cost includes necessary Engineering and Design and Supervision and Administration.

3/ Includes $124,000 for hydraulic model study.

4/ Includes $332,000 for mitigation of adverse environmental impacts.

5/ Does not include costs for self-liquidating features of the project, such as dredging of mooring areas and construction of docks, launching ramps, and public service facilities. The estimated non-Federal cost for these self-liquidating features is $6,340,000 (August 1981 price levels).

Table 25 - Estimated Investment Cost and Annual Charges for Alternative Plan 3b (August 1981 Price Levels) 1/

Item	Navigation	Recreation	Total
	$	$	$
TOTAL INVESTMENT FOR THE PROJECT:			
Total Project Cost, Excluding Lands 2/	5,736,000	80,000	5,816,000
Interest During Construction	423,000	6,000	429,000
Lands and Damages	493,000	0	493,000
Total Investment, Including Lands	6,652,000	86,000	6,738,000
ANNUAL CHARGES FOR THE PROJECT:			
Interest	490,500	6,400	496,900
Amortization	14,300	200	14,500
Maintenance	107,200	2,000	109,200
Total Annual Charges	612,000	8,600	620,600
FEDERAL SHARE:			
Total Investment Cost			
Total Project Cost	2,906,000	40,000	2,946,000
Interest During Construction	214,300	3,000	217,300
Total Investment	3,120,300	43,000	3,163,300
Annual Charges			
Interest	230,100	3,200	233,300
Amortization	6,700	100	6,800
Maintenance	100,800 3/	0	100,800
Total Annual Charges	337,600	3,300	340,900
NON-FEDERAL SHARE:			
Total Investment Cost, Including Lands			
Total Project Cost, Excluding Lands	2,830,000	40,000	2,870,000
Interest During Construction	208,700	3,000	211,700
Lands and Damages	493,000	0	493,000
Total Investment, Including Lands	3,531,700 4/	43,000	3,574,700
Annual Charges			
Interest	260,400	3,200	263,600
Amortization	7,600	100	7,700
Maintenance	6,400 5/	2,000 6/	8,400
Total Annual Charges	274,400	5,300	279,700

1/ 7-3/8 percent interest rate, 50-year life (i = .07375, amort. = .00216).
2/ Includes cost for mitigation of adverse environmental impacts.
3/ 100 percent Federal for general navigation.
4/ Excludes $6.34 million for self-liquidating costs.
5/ 100 percent non-Federal for mitigation.
6/ 100 percent non-Federal.

Table 26 - Summary of Benefits and Costs for Plan 3b
(August 1981 Price Levels)

	Navigation	Recreational Fishing	Total Project
	$	$	$
Average Annual Benefit	896,000	28,200	924,200
Average Annual Cost			
Federal	337,600	3,300	340,900
Non-Federal	274,400	5,300	279,700
Total	612,000	8,600	620,600
Net Benefits	284,000	19,600	303,600
Benefit-Cost Ratio	1.46	3.28	1.49

SECTION VII
RECOMMENDATION

I recommend that a small-boat harbor and harbor-of-refuge and recreational fishing facilities be constructed as an integral part of the State Park at Geneva-on-the-Lake, OH. I further recommend that the selected plan of improvement, known as Alternative Plan 3b, (Modified Wetland/Parking Lot Harbor) and shown on Plate 16 in Appendix H, as formulated in this Reformulation Phase I General Design Memorandum, be used as a basis for the Phase II General Design Memorandum. The total first cost of the project, on August 1981 price levels, is $5,816,000 1/ consisting of: $2,870,000 Corps of Engineers; $76,000 U.S. Coast Guard; and $2,870,000 non-Federal. These recommendations are made with the understanding that non-Federal interests must furnish assurances satisfactory to the Secretary of the Army that they will:

(1) Provide without cost to the United States all lands, easements, and rights-of-way required for construction and subsequent maintenance of the project and for aids to navigation upon the request of the Chief of Engineers, including suitable areas determined by the Chief of Engineers to be required in the general public interest for initial and subsequent disposal of spoil, and also necessary retaining dikes, bulkheads, and embankments therefore or the cost of such retaining works;

(2) Hold and save the United States free from damages due to the construction and subsequent maintenance of the improvements except for damages due to the fault or negligence of the United States or its Contractors:

(3) Provide and maintain necessary access roads, mooring facilities, and parking and service areas, including a launching ramp, all essential sanitary facilities, and an adequate public landing or wharf, with provisions for the sale of motor fuel, lubricants, and potable water, available to all on equal terms;

(4) Provide and maintain depths in the service channels to principal docks and berthing areas commensurate with those provided in the Federal project;

(5) Accomplish without cost to the United States such relocations or alterations of utilities as necessary for project purposes;

(6) Establish rules to control the use, growth, and development of the harbor and related facilities, with the understanding that public facilities will be open to all on equal terms;

(7) Reserve spaces within the harbor adequate for the accommodation of transient craft;

(8) Establish regulations prohibiting discharge of pollutants into the waters of the harbor area by users thereof, which regulations shall be in

1/ $6,309,000 (see Table 24) minus $493,000 economic cost for lands and damages.

accordance with applicable laws or regulations of Federal, State, and local authorities responsible for pollution prevention and control;

(9) Contribute in cash 50 percent of that portion of the first cost of Federal construction allocated to recreational navigation, exclusive of aids to navigation, a contribution presently estimated at $2,664,000 on August 1981 price levels, to be paid in a lump sum prior to initiation of construction, or in installments over the construction period at a rate proportionate to the proposed or scheduled expenditure of Federal funds, as required by the Chief of Engineers, the final apportionment of cost to be made after actual costs have been determined;

(10) Contribute in cash one-half of the cost of modifications necessary to provide for recreational fishing from the breakwaters, an amount currently estimated at $40,000 on August 1981 price levels;

(11) Bear all costs of maintenance, operation, and replacement of these modifications for recreational fishing, an amount currently estimated at $2,000 on August 1981 price levels on an average annual basis;

(12) Comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (Public Law 91-646 approved 2 January 1971) in acquiring land, easements, and rights-of-way for construction and subsequent maintenance of the project and inform affected persons of pertinent benefits, policies, and procedures in connection with said Act;

(13) Provide without cost to the United States all lands, easements, and rights-of-way required for construction and subsequent maintenance of the mitigation features of the project. Contribute in cash 50 percent of that portion of the first cost of Federal construction allocated to mitigation of adverse environmental impacts, a contribution presently estimated at $166,000 on August 1981 price levels, to be paid in a lump sum prior to initiation of construction, or in installments over the construction period at a rate proportionate to the proposed or scheduled expenditures of Federal funds, as required by the Chief of Engineers, the final apportionment of cost to be made after actual costs have been determined; and

(14) Bear all costs of maintenance, operation, and replacement of these mitigation features, an amount currently estimated at $6,400 on August 1981 price levels, on an average annual basis.

And provided further, that the improvement for navigation may be undertaken independently of providing public recreational facilities for breakwater fishing whenever the required local cooperation for navigation has been furnished.

GEORGE P. JOHNSON
Colonel, Corps of Engineers
Commanding

FINAL ENVIRONMENTAL IMPACT STATEMENT

Proposed Plans for the Small-Boat Harbor
at Geneva-on-the-Lake, Ashtabula County, OH

The responsible lead agency is the U.S. Army Engineer District, Buffalo, NY.

The responsible cooperating agencies are the Ohio Department of Natural Resources and the United States Fish and Wildlife Service.

Abstract: Geneva State Park is located along the Lake Erie shore in the northwest corner of Ashtabula County, OH. The Buffalo District has investigated public concerns relating to inadequate facilities for recreational navigation there. Of the five plans which have been considered during recent stages of planning, one has been the subject of detailed planning, in addition to the No Action Plan. This is Alternative Plan 3b, the Modified Wetland/Parking Lot Harbor Plan, which includes environmental mitigation features. This has been designated as the selected plan based upon its potential performance in addressing the identified public concerns, including mainly the provision of an economically-efficient boat harbor with minimum damage to the natural environment and minimum disruption of park facilities.

SEND YOUR COMMENTS TO THE DISTRICT ENGINEER BY: 15 November 1981

If you would like further information on this statement, please contact:

Mr. Robert Klips
U.S. Army Engineer District, Buffalo
1776 Niagara Street
Buffalo, NY 14207

Commercial Telephone: (716) 876-5454
FTS Telephone: 473-2171

NOTE: Information, displays, maps, etc. discussed in the Geneva-on-the-Lake Main Report are incorporated by reference in the EIS.

LIST OF PREPARERS

The following people were primarily responsible for preparing this Draft Environmental Impact Statement:

Name	Expertise	Experience	Professional Discipline
Mr. Richard Aguglia	Civil Engineering	Three years, U.S. Army Engineer District, Buffalo (Project Manager)	Civil Engineering
Mr. Philip Berkeley	Aquatic Biology	Five Years, U.S. Army Engineer District, Buffalo (EIS Studies)	Wildlife Biologist
Ms. Mary Jo A. Braun	Political Science	Three Years, U.S. Army Engineer District, Buffalo (EIS Studies)	Social Scientist
Mr. William Butler	Geography	Two Years, U.S. Army Engineer District, Buffalo (EIS Studies)	Social Scientist
Mr. Robert Klips	Botany	Three Years, U.S. Army Engineer District, Buffalo (EIS Studies)	Biologist
Mr. Richard Lewis	Cultural Resources	Four Years, U.S. Army Engineer Districts, Rock Island and Buffalo (Cultural Resources and EIS Studies)	Archaeologist

SUMMARY

Major Conclusions and Findings

As a first task in the planning process, problems in a study area are identified by eliciting information from the public about water and related land resource management needs. The needs identified during the Geneva-on-the-Lake Small-Boat Harbor study include satisfying the demand for a recreational small-boat mooring area and harbor-of-refuge while at the same time causing no avoidable net loss of wetlands fish and wildlife resources, and also preserving, so far as possible, existing park facilities.

As mandated by the Corps planning process, various alternative plans have been formulated to address area needs and planning objectives, and these plans have been addressed and evaluated for economic and environmental impacts. During early Stage 2 planning, four economically feasible concepts were developed. Refinement of these alternatives through coordination with other agencies and incorporation of more recent survey data resulted in the tentative selection of a preferred implementable alternative. This plan, Alternative 3b, is a modification of an earlier devised plan and provides for a 360-slip, all-weather harbor located partly on land occupied by a wetland ecosystem and partly on land occupied by parking and lawn areas. Specific environmental mitigation measures to accomplish wetland protection have been developed for implementation and incorporated into the project plan. Final selection and recommendation of this plan was accomplished after public and agency circulation and coordination of the Draft Reformulation Phase I General Design Memorandum and Draft Environmental Impact Statement.

The National Economic Development (NED) Plan is that plan which produces maximum net economic returns. Economic returns are the amount by which annual benefits exceed annual costs. Using this rationale, Alternative 3b, the Modified Wetland/Parking Lot Plan, has been designated as the NED Plan.

Recognizing that environmental quality (EQ) has both natural and human manifestations, an EQ Plan addresses the planning objectives in the way which emphasizes aesthetic, ecological, and cultural contributions. Beneficial EQ contributions are made by preserving, maintaining, restoring, or enhancing the significant cultural and natural environmental attributes of the study area. Designating an EQ plan involves measuring the enviromental changes related to different plans and selecting the plan which, based on public input, contributes to, or is most harmonious with, environmental objectives. The fundamental environmental objective in the Geneva-on-the-Lake study is to minimize or eliminate any adverse environmental impacts resulting from the project on the wetland area.

Candidate EQ Plans must make net positive contributions to the components of the EQ account. At a minimum, an alternative must make net positive contributions to the EQ account in order to be designated the EQ plan. If it is impossible to develop a plan which meets these minimum requirements, an EQ plan cannot be designated. Rather, the plan which is least damaging to the environment will be identified. In the Geneva-on-the-Lake study, no plan provides net contributions to the EQ account. All implementable plans,

including the selected plan, cause initial wetland destruction by locating harbor facilities, in part, on currently existing wetlands. In the selected plan, this destruction would be compensated for by implementation of specific environmental mitigation measures. These measures would offset specific negative environmental impacts, but would not result in net environmental benefits. Also, all implementable alternatives would cause some negative environmental effects which mitigation would not compensate for. The plan which would result in minimal impact is Alternative Plan 3b, the Modified Wetland/Parking Lot Plan, including environmental mitigation, which therefore is designated as the plan which is least damaging to the environment.

The selected plan is Alternative 3b, Modified Wetland/Parking Lot Harbor, with environmental mitigation. The rationale behind selection of this plan is that it is the most economical plan, and yet causes the least destruction of beneficial natural and man-made features of the park.

Areas of Controversy

To date, there are no unresolved issues that were the subject of major disagreement among public interests during the course of the study. During Stage 2 planning, plan selection was the subject of disagreement between study participants, with the U.S. Fish and Wildlife Service favoring an alternative (Alternative 1, the Cowles Creek Harbor) which was strongly opposed by the local sponsor, ODNR. The issue was resolved through coordinated development of an alternative (the selected plan) which was acceptable to all interests.

Unresolved Issues

There are no unresolved major disagreements among study area interests, to date.

Relationship to Environmental Requirements

The Stage 3 plans have been considered in relation to a number of Federal laws and policies, as well as State laws, which have bearing on the issues involved. Project planning has been in full compliance with the following Federal Acts: Water Resoures Planning Act of 1965; Fish and Wildlife Coordination Act of 1958; National Historic Preservation Act of 1965; National Environmental Policy Act of 1969; Coastal Zone Management Act of 1972; the Endangered Species Act of 1973; and the Federal Water Pollution Control Act of 1972, as amended by the Clean Water Act of 1977. Also, the following Executive Orders have been complied with: EO 11990 - Protection of Wetlands and EO 11988 - Flood Plain Management.

Section 404 of the Federal Water Pollution Control Act of 1972 (P.L. 92-500) requires that an evaluation of the effects upon water quality be performed for any proposed discharge of dredged or fill materials into waters of the United States. An evaluation has been performed and is included as Exhibit F-2 of Appendix F.

PROPOSED PLANS FOR THE
SMALL-BOAT HARBOR AT
GENEVA-ON-THE-LAKE
ASHTABULA COUNTY, OH

FINAL ENVIRONMENTAL IMPACT STATEMENT

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SECTION 1

NEED FOR AND OBJECTIVES OF THE ACTION

THE STUDY

1.01 Introduction - Corps of Engineers involvement in studying the feasibility of construction of a small-boat harbor in the Geneva-on-the-Lake, Ohio area dates from 1945 when Public Law 79-14 directed the Secretary of War to conduct preliminary surveys of the south shore of Lake Erie with a view to the establishment of harbors and harbors-of-refuge for light draft commercial and fishing vessels as well as for recreational craft. In July 1946, a preliminary examination report favoring construction at 33 sites on the coast of Lake Erie was completed. The preliminary examination report recommended further study of a site at Arcola Creek, a site about 2 miles west of Geneva State Park. Preparation of detailed survey reports on the favorable sites was authorized by the Chief of Engineers, in December 1946.

1.02 During the ensuing years, the State of Ohio, which was developing a State Park at Geneva-on-the-Lake, requested that the Geneva State Park site be substituted for the Arcola Creek site. This was approved, and in February 1969, an Interim Feasibility report was completed recommending the construction of a small-boat harbor at Geneva-on-the-Lake. The recommended project was subsequently, in 1970, authorized for construction under Section 201 of the 1965 Flood Control Act (PL 89-298).[1/] Funds to initiate the advanced engineering and design of the project were appropriated in FY 1978. These funds were used to prepare the Reformulation Phase I GDM and EIS presented herein and have led to the general conclusions and recommended plan presented in these documents.

1.03 Several legislative and physical changes, having a direct influence on the feasibility of constructing the authorized project, have occurred since the project was authorized in 1970. These changes include: (1) the construction of a parking lot at the location originally envisioned for the boat mooring area; (2) the recognition of the existence of a wetland within the location originally planned for the launching area and turning basin; and (3) numerous legislative changes regarding the protection of the environment, many of which are directed toward wetland preservation. The plans considered during this reformulation study have been developed in consideration of these physical and legislative changes, and therefore all differ somewhat from the authorized project.

PUBLIC AND AGENCY CONCERNS

1.04 Harbor Location - The primary dominating concern is that the State of Ohio, the project local sponsor, opposes the acquisition of lands outside the Geneva State Park boundaries for construction of a small-boat harbor. The possible area is further limited to an area between Cowles Creek and a

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1/ A detailed description of the authorized plan is contained in Section I of the Final Phase I GDM Report.

wetland to the west of the parking lot. 1/ Therefore, with the exception of a possible mitigation site at Wheeler Creek, all alternatives formulated for this Phase I study were limited to the area between Cowles Creek and the wetland area.

1.05 Parking Lot - A concern, expressed by the State of Ohio, is that the construction of the mooring area and the overall plan would have the least impact possible on the existing parking lot at Geneva State Park.

1.06 Protection of Wetlands - A significant concern of the study, as defined in various Federal laws and expressed by the U. S. Fish and Wildlife Service, is that the construction of Federal projects avoid the destruction of wetlands to the greatest extent possible considering the need for the project and its practicability of construction in nonwetland areas.

1.07 Littoral Processes - Construction of navigation structures and the dredging of channels along the open shorelines of the Great Lakes often has adverse effects on littoral processes and the stability of beach areas. The fact that any boat harbor plan for Geneva-on-the-Lake involves breakwaters and channel dredging makes the impacts on littoral processes a concern of the study.

1.08 Recreational Boating and Fishing - The primary concern related to this study is the desire by local interests for better boating facilities and possibilities for recreational fishing in Lake Erie. These concerns and desires have been expressed at public meetings and workshops for the study, and the demand for additional facilities has been determined by appropriate economic analysis.

1.09 Avoidance of Impacts on Bathing Areas - Bathing beaches exist at Geneva State Park. Therefore, one of the concerns of the study is that any plans for a recreational boat harbor avoid adverse impacts on such areas.

PLANNING OBJECTIVES

1.10 Introduction - The development of various alternative small-boat harbor plans for Geneva-on-the-Lake, Ohio, considered both the two national water resource planning objectives as defined by the U. S. Water Resources Council and a number of study area specific planning objectives developed in relation to the previously described public and agency concerns for Geneva-on-the-Lake. The national planning objectives are:

a. To enhance National Economic Development (NED) by increasing the value of the nation's output of goods and services and improving national economic efficiency. For recreational boating projects such as the Geneva-on-the-Lake project, the return to the boat owner on the investment in recreational boats is a measure of NED.

1/ This area is illustrated on Plate 2 in Appendix H, of the Final Phase I GDM Report.

b. To enhance the quality of the environment (EQ) by the management conservation, preservation, creation, restoration, or improvement of certain natural and cultural resources and ecological systems.

1.11 Study Specific Planning Objectives - Specific planning objectives are the National, State, and local water and related land resources management needs (opportunities and problems) specific to a study area that can be addressed to enhance National Economic Development and Environmental Quality. Based on a review of the directives established by the authorizing resolutions for a small-boat harbor and harbor-of-refuge at Geneva State Park, previous reports for the area, statements by individuals in the private sector, input from officials at many levels of government and an analysis of the problems and needs of the study area as discussed previously, the following specific planning objectives for the Geneva-on-the-Lake Small-Boat Harbor project have been identified:

a. Appreciable recreational boating demand exists in the area which is presently unfulfilled due to a lack of adequate harbor facilities. Therefore, one objective of this study will be to provide a recreational harbor facility for shallow draft recreational craft which will also enhance the development of the existing State park at Geneva-on-the-Lake.

b. Hazards to small-boat navigation exist due to the absence of a harbor or natural shelter in the 29-mile reach of Lake Erie between Ashtabula Harbor and Fairport Harbor. The need for a harbor-of-refuge facility becomes more critical with each passing year as more and more recreational craft take to Lake Erie. Therefore, the second objective of this study will be to provide a harbor-of-refuge for light-draft recreational craft between these two Federally improved deep-draft harbors.

c. Due to the State Park's location near good recreational fishing areas of Lake Erie, local interests state that appreciable recreational fishing needs exist in the area. Therefore, another objective of this study will be to incorporate, if justified, such facilities in the project as are necessary to aid in meeting the land-based recreational fishing needs of the area. This need could be met, for example, by providing access onto any breakwaters that may be constructed for the small-boat harbor.

d. Any development that would modify the existing wetland area within the State Park poses severe environmental concerns. Therefore, one objective of this study will be to minimize or eliminate any adverse environmental impacts resulting from this project on the wetland area. This objective could be met, for example, by relocating the authorized harbor project, relocating the existing wetland area, or increasing the quality of the remaining wetland area if a portion of the wetland area is destroyed.

e. Any development that disrupts existing park facilities poses severe concerns to the State of Ohio. Therefore, one objective of this study will be to minimize or eliminate any adverse impact on existing park facilities. This objective could be met, for example, by relocating the authorized harbor project or relocating the existing park facilities.

f. The maintenance of national strength and satisfactory levels of living will be achieved by increased national income and productivity. Therefore, one objective of this study will be to maintain or improve the economic status of the area. This objective could be met by constructing a harbor for which the benefits derived from the project exceed the project costs.

g. Previous Corps reports have indicated the need for shoreline protective works to reduce shoreline erosion at Geneva State Park. Therefore, another objective of this study will be to incorporate such facilities as are required to make the harbor project compatible with the existing and future shoreline protective works at the State Park.

1.12 The development of small-boat harbor plans for Geneva-on-the-Lake, Ohio, has attempted to satisfy, to the maximum extent possible, as many of the planning objectives described above as possible.

SECTION 2

ALTERNATIVES

2.01 Introduction - The planning, development, assessment, evaluation, and documentation of the various alternative small-boat harbor plans for Geneva-on-the-Lake has been based on several factors as described below:

a. The original project authorization for construction of a small-boat harbor at Geneva-on-the-Lake.

b. The views, needs, and concerns expressed by concerned agencies, the concerned public and the potential local cooperator (The Ohio Department of Natural Resources).

c. The national water and related land resource objectives as defined in Principles and Standards (P&S), 33 CFR 290-295.

d. The various local planning objectives developed for the study.

e. The Corps of Engineers 1105-2-200 series of regulations dealing with multiobjective planning of water resource related projects. These regulations require that feasibility studies be conducted in three stages. Stage 1 - Reconnaissance level (formerly Plan of Study level) determines if there is any Federal interest in the study area and determines the future course of the study. Stage 2 - Development of Intermediate Plans explores a broad range of alternative plans, screens them out, and advances certain plans to the next stage. Stage 3 - Development of Detailed Plans involves the further development and refinement of plans advanced from Stage 2. Throughout this process, four planning tasks are performed and reiterated. These are: (1) problem identification, (2) formulation of alternatives, (3) impact assessment, and (4) evaluation. As the study progresses through the three stages, emphasis is shifted from problem identification and formulation of alternatives to impact assessment and evaluation.

f. The National Environmental Policy Act (NEPA) of 1970 (PL 91-190). The Council on Environmental Quality Regulations for implementing the procedural provisions of the National Environmental Policy Act (40 CFR 1500-1508). Corps of Engineers regulations including: ER 200-2-2, Policy and Procedures for Implementing NEPA; ER 1105-2-920, Feasibility Reports: Organization and Content; and other applicable Corps of Engineers Regulations.

g. All applicable laws and statutes regarding environmental protection.

BOAT HARBOR PLANS ELIMINATED DURING STAGE 2

2.02 This section will briefly discuss the two plans developed during Stage 2 efforts that were not carried into Stage 3 planning, development of detailed plans. These are the Cowles Creek Harbor Alternative and the Wetlands Harbor Alternative - Plans 1 and 4, respectively. It will also briefly explain why these plans were eliminated from further consideration.

2.03 Alternative Plan 1, the Cowles Creek Harbor Alternative would have located a 400-slip boat harbor and harbor-of-refuge at the mouth of Cowles Creek. A harbor at this location would cause severe disruption of park facilities by isolating the beach area east of Cowles Creek from the bathhouse west of the creek. Currently, a footbridge connects these two areas and pedestrians pass from one to the other over a distance of 850 feet. With the harbor in place, the distance required to be walked between sites would be increased nearly fourfold to 3,150 feet, mostly around the harbor, crossing the creek over a replacement footbridge further south and passing through areas which would be the site of intensive motor vehicle use. This would be a considerable inconvenience which would severely diminish the quality of the recreational experience of anyone endeavoring to utilize both the east beach area and the bathhouse. Furthermore, the harbor entrance and its associated intense boating activity would be located very near the east beach area and this would pose an aesthetic disruption and a safety hazard to swimmers there. The aquatic ecosystem of Cowles Creek would be adversely affected by a harbor at this location. Because of these negative aspects of this harbor location, and because it would occupy 9 acres (half) of the existing parking area in the immediate vicinity, a harbor at this site is not acceptable to the local sponsor, the Ohio Department of Natural Resources. For these reasons, the Cowles Creek Harbor Alternative was eliminated from further study.

2.04 Alternative Plan 4, the Wetlands Harbor Alternative, would have located the small-boat harbor nearly entirely within the existing wetland area, thereby causing disturbance and destruction of roughly 7.3 acres of land which is in a fairly natural state, including 3.8 acres of wetlands for which mitigation would not be possible. This plan is unacceptable for environmental reasons because of the great harm which would be done to a significant natural area. This plan is strongly opposed by the U.S. Fish and Wildlife Service. Also, because most of the wetland destruction is avoidable by locating the harbor elsewhere, the plan is in violation of Executive Order 11990, which prohibits Federal participation in projects which destroy wetlands if a practical alternative to such construction exists. Because there are practical alternative harbor sites for which wetlands destruction would be less, and could be compensated for by mitigation, the Wetlands Harbor Alternative is no longer being considered for implementation and has been eliminated from further study.

FEATURES COMMON TO ALL PLANS CONSIDERED DURING STAGE 3

2.05 All structural plans have certain elements in common and the differences between them are primarily matters of precise location, size, and shape of the harbor (and, in the case of the selected plan, the inclusion of structural features and a maintenance plan for mitigation of adverse effects to the wetlands, which is discussed in detail under the description of that plan only, in the section of this chapter entitled: Plans Developed in Detail). These are: (1) mooring areas and service facilities; (2) entrance channel with a depth of 8 feet below LWD protected by rubblemound breakwaters extending from the shore into Lake Erie; (3) interior channels with a depth of 6 feet below LWD, and, (4) use of a sand bypass system to

facilitate placement of beach material at sites on the east side of the east breakwaters.

2.06 Mooring areas and service facilities would be provided for either 360 or 400 boats. The project would necessitate, but would not include, additional parking which would be required to accommodate the 500 to 600 cars which would be brought to the marina during times of peak use. A public dock with public service facilities including restrooms, fuel and oil sales, and sewage pumpout stations is included in all plans, as are launch ramps. The State Park derives its water from the Geneva-on-the-Lake municipal water supply through a 10-inch main along Lake Road. From this main, a 6-inch line serves the bathhouse, which would be adequate to serve the marine public service facilities.

WITHOUT CONDITIONS (NO-ACTION ALTERNATIVE)

2.07 This study has demonstrated the currently existing marsh/swamp ecosystem to be a productive, diverse, valuable and limited (both within the park and regionally) natural resource. In the absence of Federal improvements in the area, this resource, including the marsh component which has been the subject of attention including mitigation planning, would be likely to continue to exist in nearly its present condition. There would be fairly long-term cyclic fluctuations in the area of the wetlands, correlated with variations in the water levels of Lake Erie.

2.08 The wetland area would however, exist in a vulnerable state as human agencies apathetic or antagonistic to the perpetuation of natural conditions continue to act upon the area. Demonstrated current and potential threats to the integrity of the wetlands are: (1) land management practices which currently are being employed to maintain a lawn area (a closely-trimmed biologically sterile monoculture of cultivated grass plants) as closely as possible and encroaching upon the wetland on the east side and; (2) the potential for development of park facilities on the wetlands like that which has already eliminated a large portion of the marsh component of the marsh/swamp complex. The latter possibility, development on the wetlands, is apparently unlikely due to the present lack of any such plans and because of a Federal policy discouraging the issuance of the permit (pursuant to Section 404(b) of the Clean Water Act) which would be required for construction in a wetland.

2.09 In its present condition, Geneva State Park offers no recreational facilities for boaters who desire to use Lake Erie. The closest harbors are located in Ashtabula Harbor, OH, approximately 12 miles to the east and in Fairport Harbor, OH, approximately 17 miles to the west. However, the existing facilities for recreational boating at these two harbors are currently utilized to full capacity with long waiting lists for permanent dock space. A regional boating demand analysis, and local public sentiment, have indicated that there is an unfulfilled demand for additional permanent mooring facilities and public launching facilities in the area. If the no-action alternative is carried out, this demand would remain unsatisfied, and potential local boaters would pursue alternate recreational activities, or none at all.

2.10 Local interests, which stated that they consider a small-boat harbor at Geneva State Park a prerequisite to attracting tourists to their resort area, would live within an area economy lacking this particular enhancement.

2.11 Hazards to small-boat navigation exist due to the absence of a harbor-of-refuge or natural shelter in the 29-mile reach of Lake Erie between Ashtabula and Fairport Harbors. Due to the rapid generation of heavy wave action on this relatively shallow lake, small boats cruising in this unprotected area may have too great a distance to travel to safety. Under no-action conditions, this situation would continue to exist and the safety of the boating public would be endangered.

PLANS ELIMINATED EARLY IN STAGE 3

2.12 Introduction - Three plans were considered during Stage 3. Two of these were eliminated from detailed design studies when the selected plan was developed through modification of one of them. These plans are the Offshore/Onshore Harbor (Plan 2), the original Wetland/Parking Lot Harbor (Plan 3), and the Modified Wetland/Parking Lot Harbor (Plan 3b, the selected plan). The two plans which have not been the subject of detailed design study are described below, along with the rationale for their elimination.

2.13 The Offshore/Onshore Harbor (Alternative 2) would have provided an all-weather harbor contiguous to the existing marshland and west of the bathhouse as shown on Plate 13. This location was selected to limit encroachment into the wetlands and existing parking lot.

2.14 The harbor entrance would have been located at a depression in the bedrock profile, thus minimizing costly rock excavation. The L-shaped west breakwater, with a crest elevation of 14 feet above LWD, would have reduced the interior design wave to 1 foot. With a total length of 1,300 feet, this breakwater would have enclosed an area constituting an offshore mooring area of roughly 7.6 acres, with berthing for 300 boats. Part of this area would have been excavated to reach a depth of 6 feet below LWD. To permit water circulation through the mooring area, the west breakwater would not have been shore-connected, and a 100-foot long sandtrap breakwater, parallel to shore, would serve as a site of sand accumulation from which material periodically would have been pumped to the east side of the east breakwater. For planning purposes, it was assumed that the public dock would have been located offshore, near the entrance channel. The east breakwater would have been 600 feet long and shore-connected.

2.15 The interior channel providing access to the onshore mooring area was located so as to limit encroachment into the wetlands and parking lot and also, like the offshore harbor entrance, its general location was determined by the bedrock profile in order to minimize costly rock excavation. An L-shaped mooring area of about 2.5 acres would have provided berthage for 100 boats. Launching ramps would have been located near the existing parking facilities. The Offshore/Onshore Harbor Plan was conceived as a compromise plan to minimize the amount of direct damage to the wetlands and the parking lot by situating the harbor in part between them and partly offshore. Thus,

the area of wetlands occupied is slightly less than that of the Wetlands/ Parking Lot Plan, and there is only a very slight area along the western edge of the parking lot which would be occupied by the mooring area. However, because the offshore berthing area would be a considerable distance of roughly 3,000 feet from existing parking facilities, additional parking facilities closer to the berthing area would have been required. There would therefore have been boating activities and development on three sides of the wetlands area, rather than only on one side, as in the case of the Wetland/Parking Lot Plan, and secondary impacts to the wetlands, i.e., noise, disturbance through invasion of the area by people, etc., would have been much greater with the Offshore/Onshore Harbor Plan than with a Wetland/Parking Lot Harbor alternative. Since economic costs of this harbor plan were greater than that of the Wetland/Parking Lot Plan and it would not have been less damaging environmentally after required parking facilities were built, planning efforts after early Stage 3 were directed towards a Wetland/Parking Lot Harbor alternative, and the Offshore/Onshore Plan was not the subject of detailed design.

2.16 The Wetland/Parking Lot Harbor Alternative, as originally conceived (Alternative 3) would have provided an onshore harbor with berthing for 400 boats on lands about equally distributed between the wetlands and parking lot, as shown on Plate 14. The harbor entrance, located to take advantage of the existing bedrock trough, would have been protected by an arrowhead breakwater system. The entrance channel would have been oriented in a south-southeasterly direction to bypass the mouth of the marsh creek with the objective of minimizing the impact upon the wetland area. A short, low jetty would have been required on the west side of the channel at the lake-land interface to provide a stable channel at this location and to prevent encroachment into the marsh creek, a short distance to the west. The remainder of the entrance channel would have been protected by riprap to prevent erosion of the sideslopes from turbulence. The interior channel would have serviced a large basin of about 7.9 acres with berths for 340 boats to the south and a small mooring area of 1.4 acres with 60 berths to the north. The perimeter of the marina complex would have been protected by riprap and vertical concrete walls. The public dock would have been located south of the existing bathhouse and the launching ramps at the northeast corner of the marina, convenient to existing parking.

2.17 A Wetland/Parking Lot Harbor Plan was identified early in Stage 3 as the most promising type of small-boat harbor alternative because it could apparently satisfy the planning objectives in the most cost-effective manner and the negative environmental impacts associated with it could likely be mitigated. Late in Stage 2, the Ohio Department of Natural Resources indicated that the State would prefer a 360-boat harbor, slightly smaller than the original Plan 3. Subsequently, the Wetland/Parking Lot Harbor Plan was modified to include environmental mitigation measures and the slightly decreased harbor capacity. The modified plan, referred to as Alternative Plan 3b, has been developed in detail and its original form (Alternative Plan 3) has been eliminated from further study.

PLANS CONSIDERED IN DETAIL

2.18 Multiobjective planning and interagency coordination in the form of workshop meetings and telephone and written correspondence have resulted in the development of a boat harbor plan which is acceptable to all of the agencies participating in planning. Because each of the plans which were considered in addition to this preferred plan were unacceptable to at least one of the study participants and were clearly less effective in satisfying the planning objectives of the study, this is the only one which was developed in detail. (Several other alternatives are included in this document for comparative purposes.) This limitation of the developmental discussions and planning to only the realistically implementable alternative was performed to most effectively utilize available planning resources and to facilitate effective communication among participants.

2.19 The Preferred Plan for the Geneva-on-the-Lake Small-Boat Harbor project is known as Alternative Plan 3b, the Modified Wetland/Parking Lot Harbor Plan. This plan has been determined to be the NED plan, and the least environmentally damaging plan, and it is the selected plan. The plan would provide a 360-slip all-weather harbor located on land which is partly a wetland area and partly parking and lawn areas. Environmental mitigation measures have been developed for implementation, and have been incorporated into the project plan. These measures would provide and maintain wetland conditions on an acreage greater than that which would be destroyed by construction of the boat harbor.

2.20 The small-boat harbor mooring area and harbor-of-refuge would occupy roughly 15.6 acres inland near the shore. It would be connected with Lake Erie via an entrance channel 100 feet wide and 800 feet long, which would be protected by a pair of rubblemound breakwaters extending into Lake Erie.

2.21 The plan would initially cause a considerable amount of irreversible wetland destruction. The harbor is planned to be situated on an area which includes 2.3 acres of wet meadow, shallow marsh, and deep marsh combined. (There is a total of 6.6 acres of wet meadow and marsh in the immediate vicinity of the proposed project; this herbaceous wetland is part of a marsh/swamp complex of roughly 9.6 acres.) The completed harbor would be located contiguous to the remaining wetland area. Mitigation, through replacement in kind, by creating wetland conditions on an acreage greater than that of the wetlands lost by harbor construction is planned for the project. This includes: (1) placement of excavated material in an existing, somewhat deep, sparsely vegetated borrow pit to create an area with inundation characteristics which would be conducive to the establishment of abundant wetland plant life; (2) enlargement, using excavated material, of an existing island in a second borrow pit, to favor the establishment of nesting waterfowl there; (3) construction of a water level control device and establishment of a program to regulate water levels in the entire marsh/swamp complex to maintain wetland environmental conditions; and (4) planting of a shrub barrier between the boat harbor and the wetlands. The result of these environmental mitigation measures would be that the amount of wetlands related fish and wildlife resources in existence at Geneva State Park under post-project conditions would equal or exceed that which currently exists. A

detailed description of the mitigation plan is contained within Section 4, Environmental Effects, of this FEIS.

COMPARATIVE IMPACTS OF ALTERNATIVES

2.22 Introduction - The following table presents, in comparative form, the base and no action conditions, and the impacts of all the plans which have been considered in Stages 2 and 3. The quantities of area of each habitat type which would be affected by the various alternatives are based upon the vegetation analysis performed by the U.S. Fish and Wildlife Service, presented in the Four-Season Study Report. The figures presented here differ (by being smaller) from similar comparisons of impacts presented in previous Corps reports (the Stage 2 Document and information derived from it included in this Phase I GDM). These figures were based upon incomplete information and a less precise terminology describing habitat types, especially wetlands. While both sets of comparisons are fairly accurate in relative terms, the figures offered here are fairly accurate also in absolute terms.

Table 1 - Comparative Impacts of Alternatives
(Selected Plan is Alternative 3b)

Base Condition and Alternatives	Aquatic Resources	Air Resources	Terrestrial Resources Wetlands and Wildlife Habitat	Recreational Resources	Aesthetics
Base Condition	Available: Lake Erie, three creeks, and two small ponds (borrow pits). Nearshore lake waters are sparsely occupied biologically. Two larger creeks are site of recreational salmonid fishing. One borrow pit is the site of a small recreational panfish fishery.	Available: Acceptable quality according to the standards of the State of Ohio.	Available: Geneva State Park comprises 725 acres including: 625 acres of woods, fields and shore; 79 acres developed; 21 acres of marsh and wet meadows; three creeks and two open-water ponds (borrow pits). Wetlands support waterfowl, several plant communities, a small diverse fishery, and many songbirds; Wood ducks roost in wet woodlands in autumn. 8,800 feet of shoreline	Available: Two bathing areas, bathouse, picnic areas and sufficient parking space at bathhouse for 1,200 cars. No recreational boating facilities in area except for an unprotected launch ramp adjacent to the park. Recreational fisheries referenced under Aquatic Resources.	Available: Relatively uninterrupted shoreline, sand beach, and relatively undisturbed setting in wetlands. Unobstructed view of Lake Erie.
Alternative 1: Cowles Creek Harbor	Water Quality Impacts: Short-term impacts during construction including increased turbidity and possibility of oil and gasoline spills. Fishery Impacts: Possible disruption of Cowles Creek salmonid fishery during construction. Breakwaters would provide 0.6 acre of spawning and refuge sites for some fish species.	Impact: Temporary increases in dust, odors, and vehicle emissions during construction.	Impacts: Destruction o 3.2 acres currently in fairly natural state including 1.8 acres of wet meadow. *Enclosure by break-waters* of 500 feet of shoreline. Harbor use may result in disturbance which would eliminate wood duck roosting.	Impacts: Severance of east bathing area from bathhouse. Location of harbor between bathing areas creating safety hazard with bathers in vicinity of motorboats. Destruction of half of existing bathhouse parking. Possible provision of breakwater fishing. Provision of boating recreation opportunities. Possible occasional concentrated erosion along unprotected shoreline.	Impacts: Temporary increases in dust, noise, odors, and vehicle emissions during construction. Boat engine noise and exhaust odors would occur during navigation season. Breakwaters would obstruct view of shoreline.
Alternative 2: Offshore/ Onshore Harbor	Water Quality Impacts: Same as above. Fishery Impacts: Destruction of a small recreational panfish fishery in small ponds (borrow pits). Breakwaters would provide 1.2 acres of spawning and refuge sites for some fish species.	Impact: Same as above.	Impacts: Destruction of 4.1 acres currently in fairly natural state including 1.3 acres of marsh and wet meadow. Enclosure by break-waters of 1,200 feet of shoreline and disruption of marsh/swamp complex water level. Harbor use and secondary development may result in disturbance to wetland and elimination of wood duck roosting.	Impacts: Possible provision of breakwater fishing. Provision of recreational boating *opportunities.* Possible occasional concentrated erosion along shoreline protected by revetment.	Impact: Same as above.

Alternative 3: Wetland/ Parking Lot Harbor	Water Quality Impacts: Same as above. Breakwaters would provide 0.6 acre of spawning and refuge sites for some fish species.	Impact: Same as above.	Impacts: Destruction of 4.4 acres currently in fairly natural state, including 2.4 acres of marsh and wet meadow. Enclosure by breakwaters of 800 feet of shoreline and disruption of marsh/swamp complex water level. Harbor use may create disturbance which would eliminate wood duck roosting.	Impacts: Destruction of 30 percent of the existing bathhouse parking. Possible provision of breakwater fishing. Provision of recreational boating opportunities. Possible occasional concentrated erosion along shoreline protected by revetment.	Impact: Same as above.
Alternative 3b: (Modified Wetland/ Parking Lot Harbor (with Environmental Mitigation))	Water Quality Impacts: Same as above. Fishery Impacts: Elimination of small recreational panfish fishery at Pond A (west borrow pit). Water control structure would prevent fish movements between Lake Erie and marsh/swamp complex. Breakwaters would provide 0.6 acre of spawning for some fish species.	Impact: Same as above.	Impacts: Destruction of 4.4 acres currently in fairly natural state, including 2.3 acres of marsh and wet meadow. Conversion of a 5-acre pond into marsh. Enlargement of island in pond. Enclosure by breakwaters of 800 feet of shoreline. Harbor may create disturbances which would eliminate wood duck roosting.	Impact: Destruction of 25 percent of the existing bathhouse parking. Provision of breakwater fishing. Provision of recreational boating opportunities. Possible occasional concentrated erosion along shoreline protected by revetment.	Impact: Same as above.
Alternative 4: Wetlands Harbor	Water Quality Impacts: Same as above. Fishery Impacts: Elimination of small recreational panfish fishery in west borrow pit. Elimination of small nongame wetlands fishery. Breakwaters would provide 0.5 acre of spawning and refuge sites for some fish species.	Impact: Same as above.	Impacts: Destruction of 7.3 acres currently in fairly natural state including 3.8 acres of marsh and wet meadow. Enclosure by breakwaters of 600 feet of shoreline and disruption of marsh/swamp complex water level. Harbor use would probably create disturbance which would eliminate wood duck roosting.	Impact: Possible provision of breakwater fishing. Provision of recreational boating opportunities. Possible occasional concentrated erosion along shoreline protected by revetment.	Impact: Same as above.
No Action	No impact.	No impact.	Impact: Long-term fluctuations in area of wetlands correlated with changes in Lake Erie water level and/or land use.	No impact.	No impact.

SECTION 3

AFFECTED ENVIRONMENT

ENVIRONMENTAL CONDITIONS

3.01 Geneva-on-the-Lake, OH, as shown on Plate 1 in Appendix H, is located at the northwestern corner of Ashtabula County, on the south shore of Lake Erie. It is situated about 17 miles east of Fairport Harbor, OH, and 12 miles west of Ashtabula Harbor, OH, both of which are Federally improved deep-draft harbors. Approximatley 90 percent of the land in Ashtabula County is classified as agricultural-rural. Geneva and Geneva-on-the-Lake are primarily residential communities with many summer cottages. The major industry in Geneva-on-the-Lake is tourism, including cabin rental, small shops, motels, restaurants, boat and equipment sales and rentals, and related businesses located along Ohio Route 531, east of the State Park. The communities and the park cater to a large volume of summer vacationers, who generally remain in the area for one to two weeks, with a number of persons visiting the area on weekends and holidays.

3.02 Land surfaces at the park rise abruptly forming 15 to 20-foot high bluffs near the shoreline. The lake shoreline is straight, and the inland area consists of woods, meadow, wetlands, and developed park facilities. A significant natural resource located within the park which would be directly impacted by the proposed project is a 9.6-acre wetland. The creation of this wetland is attributed to the repeated blocking of the area's drainage system by shifting sand dunes which formerly occurred here. A total of 12 major habitat types have been identified within this area, the interspersion and juxtaposition of which encourage a rich diversity of life in the area.

3.03 Water from the marsh/swamp complex formerly flowed eastward into Cowles Creek before entering Lake Erie. By 1960, either due to road construction or natural processes, water from the wetland no longer flowed into Cowles Creek but was diverted to the north and flowed directly into Lake Erie. In the late 1960's, ODNR began the development of the bathhouse and parking lot between the present wetland and Cowles Creek. In the process, the large dune complex was eliminated along with a major portion of the original marsh area and part of a mature oak forest. The excavation of fill material for the parking lot has resulted in the creation of two open ponds alongside the wetland. A more complete description of the wetland ecosystem is given beginning with paragraph 3.09, Biological Habitats and Species.

3.04 No cultural resources protected by Federal mandates that would be affected by the proposed Corps action exist in the project area. The latest published version of the National Register of Historic Places, and all subsequent revisions have been consulted. There are no registered properties, or properties listed as being eligible for inclusion thereon, that would be affected by this project. A cultural resources reconnaissance, dated 11 December 1979, concluded that no significant cultural remains exist within the project area. The survey report is included as Exhibit G-1 in Appendix G.

SIGNIFICANT RESOURCES

3.05 Recreation - Geneva State Park consists of 725 acres of State-owned property administered by the Ohio Department of Natural Resources (ODNR), Division of Parks and Recreation. The park has approximately 1-1/2 miles of Lake Erie shoreline with narrow bathing beaches located on either side of Cowles Creek. Present recreational facilities at the park include a bathhouse pavilion, picnic tables, cooking grills, lavatory facilities, 12 housekeeping cabins, and a parking lot. Proposed recreational development will provide opportunities for camping, swimming, boating, fishing, picnicking, and nature study. The park is easily assessible from Interstate 90 and State Route 534 through the city of Geneva and the village of Geneva-on-the-Lake. Attendance figures furnished by ODNR indicate that peak attendance at Geneva State Park occurred in 1976 with a total attendance of 213,116. A combination of high lake levels and shoreline erosion have resulted in a dramatic decrease in swimming activities from 1973 to 1975, however, recent park attendance figures have shown an equally dramatic increase.

3.06 Small recreation fisheries are found at the park. The major fishing concentration presently is located at the mouths of Cowles and Wheeler Creeks, where coho salmon and rainbow trout (steelhead) are caught. Also, the west borrow pit panfish (bluegill, pumpkinseed, black crappie) provide angling pleasure for comparatively few visitors to the park.

3.07 In addition to the facilities within the park, there are several golf courses, camping areas, and other recreational areas nearby. There is an unprotected boat launching ramp adjacent to the east boundary of the park. The public recreational beaches situated closest to Geneva State Park are at Ashtabula, OH (12 miles to the east), Presque Isle, PA (44 miles to the east), and at Headlands State Park in Mentor, OH (18 miles to the west).

3.08 Aesthetics - Geneva State Park is set in a fairly natural setting. Portions of the park are mowed and developed for picnicking and field recreation activities and parking areas occupy some of the land. However, other areas are in an undeveloped natural state and thus provide ideal opportunities for nature-related passive recreation activities such as bird watching, nature photography, and hiking. Since vehicles are limited to parking areas and the few park roads, noise levels are low and the resulting serene peacefulness adds to the quality of the recreation experience of current visitors to the park. The air quality is acceptable according to the standards of the State of Ohio. The portion of Lake Erie shoreline included within the park is relatively uninterrupted and provides a visually pleasing scene.

3.09 Biological Habitats and Species - This section presents a brief description of the biological habitats and species present in the marsh/swamp area of Geneva State Park that would be affected by the Selected Plan. The information presented here results from a four-season survey of the area conducted by the U. S. Fish and Wildlife Service during 1978 and

1979. 1/ The Fish and Wildlife Service surveyed the marsh/swamp area to the west of the Geneva State Park parking lot and the areas of Wheeler Creek and Cowles Creek. This section will focus on the marsh/swamp area. The reader interested in the data from Wheeler and Cowles Creeks should refer directly to the Fish and Wildlife Service Report.

3.10 The entire marsh/swamp complex at Geneva State Park can be separated into several different habitat types based upon the amount of standing or flowing water present and the typical vegetation types associated with the habitat types. Two large bodies of water, borrow pits (Ponds "A" and "B") were created when material excavated from the area in the early 1970's was used to construct the State Park parking lot. Both ponds are generally open water and are connected to the marsh by small, short channels. The west pit is about 4.2 acres in size and has a maximum depth of 7.5 feet. Steep slopes and exposed clay subsoil limit the growth of aquatic vegetation around its perimeter. The east pond is smaller, about 2.4 acres in size, and shallower with a maximum depth of 5.5 feet. A small island is present near the westerly shore of the pond and its perimeter supports a growth of Phragmites, cattails, rushes, and arrowhead. A hardwood forest of cottonwoods, aspens, ashes, and some willows partially borders both ponds. The marsh/swamp proper consists of several different habitat types. These include wooded swamp, dominated by an overstory of dead trees, shrub swamp with dense stands of buttonbush and ash; deep marsh of spatterdock and cattails, shallow marsh of dense emergent growth and a wet meadow of willows, grasses and sedges. Bordering the marsh/swamp habitats are upland habitat types consisting of oldfield with willows, cottonwoods, aspens, dogwoods, and sumac and areas of mowed grass in the parking lot area.

3.11 The variety of habitats present in the marsh/swamp complex provides excellent breeding, feeding, and resting areas for fish, birds, and mammals as well as invertebrates and reptiles and amphibians. The Fish and Wildlife Service collected 22 species of fish in the area. Typical pond species, such as golden shiner, emerald shiner, bullheads, carp, and five species of sunfish, dominated the fish community. Benthos were not sampled in detail, but a relative diverse community of isopods, amphipods, crayfish, damselfly larvae, midge larvae, and other species was identified. Midland painted turtles, snapping turtles, eastern garter snakes, and northern water snakes were all commonly observed in the marsh/swamp complex. A total of 86 species of birds were also observed in the area. The most common species were tree and barn swallows, and red-winged blackbirds. Waterfowl were also common in the area and breeding pairs of wood duck, mallard, and Canada goose were confirmed from the complex. The most common predacous mammal was the racoon. Deer, muskrat, red fox, and other small mammals were also present. Beaver and mink were also present in the marsh/swamp complex although they were not directly observed.

1/ U. S. Fish and Wildlife Service, Columbus Field Office, 3 April 1980. Four-Seasons Study, Geneva-on-the-Lake, Ashtabula County, Ohio. Exhibit G-2 of Appendix G.

3.12 In conclusion, the marsh/swamp complex, although not extremely large in size, is a valuable biological resource. The large number of different habitats present in the complex support a diversified assemblage of plant and animal species. Such areas are rather uncommon along the highly industrialized eastern Lake Erie shoreline of the State of Ohio.

3.13 Endangered and Threatened Species - Several plant and animal species, protected by the Federal Government (Endangered Species Act) and by the State of Ohio, have known ranges that encompass the Geneva-on-the-Lake area or have recently been sighted in the area. Coordination with the U. S. Fish and Wildlife Service [1/] indicates that two Federally Endangered Species occur in the Ashtabula County area. These species are the Indiana bat (*Moyotis sodalis*) and Bald eagle (*Haliaeetus leucocephalus*). Neither species has been recently sighted in the study area although Bald eagles proably migrate through the area at times. Three Ohio Endangered Species (one fish, one bird, and one plant) and two Ohio Threatened Species have recently been sighted in the study area. Table 2 gives a tabulation of information known about these species. Ohio Endangered Species are in danger of being extirpated from the State while Ohio Threatened Species are less rare, but still likely to become endangered in the near future.

3.14 Mineral Resources - Geology and mineral resources have been studied, and a detailed assessment is contained in Appendix A of the Final Phase I GDM report. Lime, sand, and gravel are produced in nearby areas, although not in the project area.

[1/] Refer to U. S. Fish and Wildlife Service letter, dated 9 October 1980, (Exhibit E-5 of Appendix E).

Table 2 - Endangered and Threatened Species Recently Verified for the Geneva-on-the-Lake Study Area

Species Common Name	Scientific Name	Status	Remarks
American brook lamprey	_Lampetra lamottei_	OE	Collected by local fishermen on Wheeler Creek (4/24/79) 1/
Sharp-shinned hawk	_Accipiter striatus_	OE	Fairly common throughout area but not as breeding pairs 1/
Inland beach pea	_Lathyrus maritimus_	OT	Found along beach zone in park and in the Wheeler Creek area in 1979 2/
Water-starwort	_Callitriche verna_	OT	Found in the wetland area at the State Park in 1979 2/
Leafy tussock sedge	_Carex aquatilis_	OE	Found near the mouth of Wheeler Creek in 1979 2/

Status: OE = Ohio Endangered
OT = Ohio Threatened

1/ Refer to U. S. Fish and Wildlife Service Four-Seasons Study Report, dated 4/3/80 (Exhibit G-2 in Appendix G).

2/ Information supplied by Ohio Department of Natural Resources, Division of Natural Areas and Preserves, Ohio Natural Heritage Program.

SECTION 4

ENVIRONMENTAL EFFECTS

SOCIAL AND ECONOMIC EFFECTS

4.01 Noise - Construction noises would occur which could be disturbing to visitors to the park if Alternative 3b is carried out. Probably the most disturbing noises would accompany the excavation of land, because this activity involves intense, persistent physical impact between machinery and dense materials to be broken up and moved (asphalt and soil). Also this excavation is to be performed on areas directly adjacent to fairly well-used park facilities where visitor population is likely to be high. Noise would also be generated by breakwater construction, affecting visitors to the park. It is anticipated that this would be a fairly continuous motor noise as water and land-based cranes and barges manipulate stone material, and would affect mainly visitors at beach areas nearest the activity.

4.02 The increased attendance at the park, facilitated mainly by increased development, i.e. construction of a small-boat harbor, would result in an increased level of noise and commercial activity there.

4.03 Displacement of People - No residential development exists in the area where construction would occur, so no displacement would occur as a result of implementing Alternative 3b. Beach visitors may choose to avoid beach sites nearest construction activity and thereby be displaced to equivalent nearby sites.

4.04 Aesthetics - If Alternative 3b is implemented, the climatic conditions of the Lake Erie coast dictate that major construction be accomplished during the period of heaviest use of the park and beaches. Offshore construction activities would present an obstruction to the natural view of the lake and in some ways detract from the scenic beauty of the shore. Conversely, some visitors to the area might derive pleasure and interest from viewing construction work in progress.

The existence of a small-boat harbor at Geneva State Park would detract in some ways from its scenic beauty. Views along the shoreline would be obstructed by breakwaters, and natural areas would be replaced by essentially lifeless structures and facilities. The increased attendance at the park, facilitated mainly by increased development for the use of motorized contrivances, would result in an increased level of noise and commercial activity there, which is precisely what many people seek to avoid during their leisure time, seeking instead peacefulness and serenity, which would be rendered less available due to this project, especially at the beach areas and the wetland complex. This would detract from the quality of the recreation experience of some members of several groups of the nonboating public, including those who engage in the following activities at the park: camping, swimming, fishing, hiking, picnicking, and nature study.

4.05 Community Cohesion - Alternative 3b would not be implemented in a community but rather in a State park, thus there would be no effect on community cohesion.

4.06 Community Growth - Since Alternative 3b would be implemented in a State park, no effect on community growth is anticipated.

4.07 Property Values - Since the proposed small-boat harbor would be located on State-owned land, no impacts to property values at the project site would occur. Commercial properties have a market value which is largely dependent upon their suitability for successful business activity. In the case of areas of high tourism, an influx of visitors determines the amount of income generated on a tract of land and in turn, largely determines property values. Therefore, the increase of recreational opportunities at Geneva-on-the Lake can be expected to increase the desirability of nearby properties and thereby their value.

4.08 Tax Revenues - The impact of small-boat harbor construction on property tax revenues would be expected, over the long run, to follow a pattern similar to the impact on property values. Over the short run, however, one would expect a more significant impact on property values than tax revenues, as there is generally a lag between the time when property values change and tax assessments are adjusted. Over the long run, though, reassessments will bring the increase in property tax revenues in line with the increase in property values.

4.09 One must take care not to equate an increase in property tax revenues with an improvement in the fiscal condition of a community. Also requiring consideration are the changes in public servicing costs. More development means not only more property tax revenues, but also higher public servicing costs which could offset the increase in revenues.

4.10 As recreation and boating related sales increase, sales tax revenues would also be expected to increase. Expenditures for dockage, fuel, and boat maintenance and supplies would contribute to this increase. Additional sales tax revenues would be generated from the sale of food and other goods and services to the boaters. The precise amount of increase cannot be estimated.

4.11 Public Services and Facilities - The demand for public services, in the form of police, rescue, and medical services would not rise appreciably due to the presence of construction crews. Other public services, such as refuse collection, sewage treatment, water supply, and public utilities, should be sufficient to accommodate any foreseeable influx of workers. After project completion, these services and facilities as well as public utilities would have to be restructured or expanded somewhat to service marina users, particularly during the boating season.

4.12 Employment/Labor Force - The input of capital into a project would result in a temporary increase in employment and labor force during construction. Implementation of Plan 3b would involve the employment of approximately 20 persons. These impacts would be of short duration, as construction is expected to occur during two seasons. Secondary impacts could be considered beneficial as a rise in employment would occur associated with marina operation and the sale of appurtenant goods and services.

4.13 Business and Industrial Activity - The construction of a small-boat harbor is a business activity of an industrial nature which can be expected to benefit those contractors which would be involved. As a result of the project, a new business activity would be introduced to the area involving the operation of the marina. Concomitant with an increase in recreational activity at Geneva State Park, would be an increase in tourist-related business activity in the area, and industrial activity related to boating.

4.14 Regional Growth - A primary planning objective of this project is to satisfy a large-scale demand for mooring spaces by prospective and existing small-boat owners in the northeast section of the State of Ohio. ODNR has stated that they consider the development of a small-boat harbor facility at Geneva State Park imperative to promoting optimum use of the park and to fulfilling this need. Therefore, the construction of a small-boat harbor at Geneva-on-the-Lake is amenable to desirable regional growth.

4.15 Displacement of Farms - No farms or farmland exists in the area of the proposed project. Therefore, no farms or farmland would be affected by the construction of a marina facility at Geneva State Park.

4.16 Mineral Resources - According to correspondence received from the U. S. Department of the Interior, 1/ the effects o' proposed construction on mineral resources is likely to be negligible.

ECOSYSTEM EFFECTS

4.17 Introduction - The tentatively selected location for the small-boat harbor partly overlaps a 9.6-acre marsh/swamp complex. This wetland, immediately inland from Lake Erie and hydrologically fed by a small creek flowing into the lake, has been determined to be a significant natural area. As detailed in Section 3 of the EIS and within the U.S. Fish and Wildlife Service Four-Seasons Study Report (Appendix G), its value is based chiefly upon the facts that it is charcterized by high habitat and plant diversity, provides breeding and roosting sites for waterfowl, supports communities of songbirds, populations of fish and is also occupied or utilized by several species of mammals. The site has a potential, presently little-exploited, usefulness as a site for educational purposes through recreational nature study. It is a type of ecosystem which is fairly uncommon along this portion of the coast of Lake Erie. In general terms, wetlands have been determined to be important natural resources that contribute significant benefits to both the natural and human environment. Executive Order 11990 recognizes the significant values provided by wetlands and requires each Federal agency to minimize the destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands. This plan would initially cause a considerable amount of irreversible wetlands destruction. The harbor is planned to be situated on an area which includes 2.3 acres of wet meadow, shallow marsh, and deep marsh combined. Because of this impact and several indirect impacts on the wetlands, a mitigation plan has been developed to prevent or reduce losses of fish and wildlife resources.

1/ Exhibit E-19 in Appendix E.

4.18 Potential Effects[1] - The major potential impacts (if the project was to be carried out without environmental mitigation) of Alternative 3b are listed below:

1. The construction of the breakwaters flanking the entrance channel would prevent the formation of a littorally deposited beach across the mouth of the marsh creek. Data from the U.S. Fish and Wildlife Service Four-Season Study indicate that without this beach, the water level within the marsh/swamp complex would be approximately the same as the lake level, resulting in a loss of water surface area of greater than 50 percent. Vegetative diversity would also decrease as water level fluctuations would be minimized.[2]

2. The excavation of the harbor basin along the east side of the marsh, where the existing bottom elevation is approximately +3 feet above LWD, would partially dewater the marsh/swamp complex even if the marsh creek mouth was blocked by natural or artificial means.

3. The excavation of the harbor basin would result in the loss of approximatley 1.3 acres of marsh (shallow and deep marsh combined) and approximately one acre of wet meadow. During the Four-Season Study, it was noted that the area of marsh proposed to be excavated produced one brood of Canadian geese and served as a feeding area for wood duck broods, mallards and coots. The section of marsh nearest the parking lot also contained the most diverse community of aquatic vegetation found anywhere within the study area.

4. Use of the shrub swamp for night roosting by wood ducks may be reduced in August, September, and October due to human activity in the harbor or along foot trails adjacent to the shrub swamp.

4.19 Mitigative Measures Proposed - The following mitigation measures have been agreed to in principle by the U.S. Fish and Wildlife Service, the Ohio Department of Natural Resources, and the Buffalo District of the Corps to prevent or reduce losses of fish and wildlife resources associated with plan implementation. They are listed in an order below which numerically corresponds to the above-stated potential impacts which they are intended to mitigate.

1. To maintain water levels within the wetland, a water control structure would be built across the mouth of the marsh creek, consisting of an earthen dike with a top elevation of 6 feet above LWD. Contained within the structure would be a stop-log structure with aluminum logs. The stop-log

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1/ Potential Effects and Mitigative Measures are adopted from the U.S. Fish and Wildlife Service Final Fish and Wildlife Coordination Act Report (East Lansing Area Office. (Exhibit G-3 in Appendix G.)

2/ A more complete explanation of this process is contained within the Section 404 Evaluation for this project (p. 6 of Exhibit F-2 of Appendix F).

structure would be approximately 5 feet wide, with a bottom elevation of +3 feet. Seasonal water level control in approximately 6-inch increments would be possible. The water levels would be selected to encourage waterfowl production and to provide feeding and resting areas for spring and fall migrants. Initially, these levels should approximate the following elevations:

Ice-out to mid-June	+ 5 feet
Mid-June through August	+ 4.5 feet
September to ice-out	+ 5.5 feet

As the final selection of seasonal water levels can only be made after an analysis of the condition and diversity of the aquatic vegetation, the management of water levels should be overseen by wildlife biologists from the Ohio Division of Wildlife.

2. To prevent water loss from the wetland into the harbor basin, an impermeable levee with a top elevation of +8 feet would be constructed along the entire west side of the harbor. The levee would have a top width of 10 feet and would be riprapped on the harbor side. A 4-foot wide path would be maintained on the harbor side of the levee to allow access to the water control structure. A more detailed description of this placement of impermeable material along the west side of the harbor is contained within the Section 404 Evaluation for this project (Exhibit F-2 of Appendix F, p. 8).

3. To compensate for the loss of wetland areas excavated for the harbor, some of the excavated material would be used to partially fill the borrow pits (Pond "A" and "B") to increase their value to waterfowl. The partial filling would decrease the warmwater fish communities in the ponds and would also decrease their use by diving ducks. Loss of fish production in the ponds and fisherman use would likely be more than offset by the planned construction of rubblemound breakwaters with fishing access to Lake Erie and the more desirable sport species. It should also be noted that the area for pond fishing is very limited at Geneva State Park due to the small size of the ponds. However, the existing ponds are not being used extensively by fishermen at the present time because of limited park attendance which is expected to increase with construction of the project.

In an attempt to insure the best possible substrate for the development of aquatic vegetation in the ponds, the fill material would be placed in the ponds with the broken shale and clay subsoil in the bottom layer, covered with a top layer (at least 1-foot thick) of organic muck and topsoil that has been excavated from the wetland portion of the mooring basin. (Because this material would contain viable seeds and vegetative plant parts capable of growing into mature plants, the wetland derived fill material would be treated as a valuable resource and would not be stockpiled for long periods which would reduce its viability.) The fill material would be compacted and portions not likely to become vegetated naturally with appropriate species would be planted with a naturally occuring grass species. The approximate desired surface elevations for the fill material are specified in Plate 16 in Appendix H of this report and Figures 2 and 3 of the final U.S. Fish and Wildlife Service Coordination Act Report (Exhibit G-3 of Appendix G). To insure proper placement of the material, the ponds need to be dewatered by

pumping. Upon completion of the work in Pond "A," the existing shallow connection between the pond and the main wetland would be deepened to an elevation of +4 feet and widened to a 5-foot bottom with 3:1 sideslopes.

In its existing state, the wetland is often flushed of sediments and dead plant materials by the breaching of the sandbar and the rapid dewatering of the wetland, thus counteracting the natural aging process of the wetland. Replicating this flushing action within the partially filled ponds by the use of the water control structure may not be possible. If the accumulation of sediment and plant debris substantially reduces the water depths of the modified ponds, mechanical removal of the accumulated material would be necessary to insure the continued use of the areas by waterfowl. Such maintenance for a period equal to the useful life of the project has been included as a part of the fish and wildlife mitigation plan for the project.

4. To provide a visual and auditory buffer between the harbor and the wetland, shrubs would be planted along almost the entire length of the 1,200-foot levee constructed on the west side of the harbor. Native species of dogwood (Cornus) would be utilized. Plants would be spaced approximately 4 feet apart in two rows, one row on the west edge of the levee top (elevation + 8 feet), and another row on the west slope of the levee at an approximate elevation of +7 feet. A grass species would be planted as ground cover.

After the partial filling of Pond "B" has been completed the access road would be covered with topsoil and planted with perennial grass. Shrub plantings may also be established and maintained along the south and west sides of the shrub swamp to augment the present vegetation and to further reduce human disturbance of the night-roosting wood ducks.

4.20 Net Effects Summary: Short-term Impacts - With the proposed small-boat harbor in place, including the mitigation recommendations which are elucidated above, there would be a loss of a small but very diverse portion of the existing wetlands and a concomitant compensatory increase in value to waterfowl of a larger acreage within the immediate vicinity of the proposed project. This latter increase in value would result from the placement of fill material in two existing ponds which are currently the site of a little-utilized warmwater fishery which would be beneficial to some species of fish in Lake Erie. The natural sand transport processes which control water levels in the marsh/swamp complex would lose effect because of the wave-attenuating and sand transport-blocking properties of the entrance channel breakwaters enclosing the portion of the shoreline that includes the mouth of the marsh creek. The continuation of the area as a wetland would thus be under human control via a small dam at the creek mouth. Wood ducks would possibly no longer use the shrub swamp as a nighttime roost despite measures to reduce noise and disturbance reaching this area.

4.21 Net Effects Summary: Long-term Impacts (a potentially variable environmental effect dependent upon the quality of maintenance measures). With the installation of the proposed water control structure the water levels of the wetland would become dependent upon the deliberate activities of people. The objective of the water control structure would be to maintain

hydrologic conditions necessary for the furtherance of the wetlands ecosystem. Periodic fluctuations would be necessary because both high (submerged substrate and vegetation) and low (exposed substrate) water levels are required for fertile wetland maintenance. High water levels, in addition to providing the conditions needed by desirable animal species, provide the conditions needed for wetland plant species and help to prevent succession to an upland type of plant community by excluding dry-site species. Occasional low water levels are useful in that they stimulate productivity by oxidizing undecomposed plant matter into useable form and allow for seed germination. Also, variability of water levels tends to encourage diversity of life forms, an important characteristic of a healthy ecosystem. Thus, the physical biological character of the wetland would be dictated largely by the regulated water levels. Because plant and animal communities and their relation to their environment are very complex and not completely known, the conditions which would prevail under the proposed modifications cannot be predicted except in very general terms. Wetlands creation and management is a fairly new and relatively inexact science.

4.21 During the course of the study, several biologists fairly knowledgeable about northeastern wetlands have examined the project site, studied the project design, and participated in the design of the project features to accomplish mitigation of project-induced damage to the natural environment. The consensus of informed opinion regarding the proposed mitigation features is that the plan is feasible, i.e., there is a fairly high inherent chance that the plan could result in a wetland area with production of waterfowl, high plant diversity and a range of habitat types for animals, with the continuation through time of these qualities on as large an area as would be so characterized soon after project construction. Additionally, all those involved emphasized that the effectiveness of the plan would not be automatically self-perpetuating but rather would require that there be a periodical, regular, deliberate monitoring of the site by individuals competent in the practice of wetlands management along with enforcement of the conditions which they prescribe for the purpose of perpetuation of wetland conditions.1/ In practical terms, the following operations and maintenance of the mitigation component of the project would be required in order to accomplish the permanent wetlands creation and protection which could offset the damages caused by construction of a small-boat harbor at this site:

1. Regularly scheduled site visits at least thrice yearly by one or more persons trained in wetlands biology and wildlife management. This person (people) would either perform firsthand or would instruct a responsible other to perform the desired water level manipulations which, correlated with site observations and a knowledge of the water tolerance ranges of the species under consideration, would be required to (a) promote the growth of desired plant species and/or provide conditions for desired animal populations, and;

1/ Refer to p. 3 of the U.S. Fish and Wildlife Service Final Fish and Wildlife Coordination Act Report (East Lansing Area Office) (Exhibit G-3 in Appendix G), and the 21 October 1980 letter from the Corps of Engineers Waterways Experiment to the Buffalo District (Exhibit E-8 in Appendix E).

(b) eliminate or discourage undesired biota, especially upland plant species or a proliferative growth of low-value weedy plants which could displace or exclude more beneficial ones. The water level regime specified for this project in the Final Fish and Wildlife Coordination Act Report (and described in paragraph 4.17, above) would be utilized initially and continued thereafter unless modification is deemed appropriate. Preferably this role would be performed by personnel of the Division of Wildlife of the Ohio Department of Natural Resources.

2. Designation of responsibility to someone employed at or near the park to ensure that the specified water level manipulations are carried out and to regularly inspect the conditions of the water control structure, the shrub plantings and the impermeable boundary layer between the wetlands and the mooring area, to be certain that they are functioning correctly and to initiate repair work if needed. The services of laborers need to be available to perform repairs.

3. Accumulation of sediment and plant debris may substantially reduce the water depths of the modified ponds. The channels connecting them with the marsh creek may become so overgrown that their effective depth is raised above the desired minimum water level in the modified ponds. The potential flow rate through the channel could become so reduced that effective flushing action of the modified ponds becomes impossible. In the event of these adverse impacts of prolific plant growth or sediment retention within the man-made wetlands, the sediments would need to be mechanically removed, with this maintenance to be carried out for the life of the project. Laborers and machinery would have to be available to accomplish this.

4.22 As described above, the management of the marsh/swamp complex wetlands is a critical part of the small-boat harbor project, because the actual success of the mitigation plan in compensating for project induced damage to the wetlands would depend largely upon the quality of this operations and maintenance. Corps policy 1/ directs that in most cases maintenance of mitigation features is beyond Corps control, with regulations specifying that mitigation features should be operated and maintained by the agency that can most efficiently do the job. In the case of the subject project, the affected wetlands would be under the control of the local sponsor, the Ohio Department of Natural Resources, and associated costs would be borne by them. It is therefore possible that lack of availability of State funds for this purpose could jeopardize the ecological integrity of the area. Also, apathy or lack of awareness of the environmental quality objectives of the project by responsible parties could result in damage, through negligence, to the ecosystem.

1/ Pertinent Corps policy regarding mitigation are specified in Chapter 18 (Fish and Wildlife) of EP 1165-2-1 (Digest of Water Resource Policies and Authorities), and ER 1105-2-129 (Preservation and Enhancement of Fish and Wildlife Resources).

4.23 In response to this sensitivity of the mitigation area to the quality of maintenance, and because the maintenance would require the State to bear monetary costs, this General Design Memorandum contains a recommendation that the specific actions which maintenance would entail be specified and included as Items of Local Cooperation. These items, enumerated in a Local Cooperation Agreement, are conditions that the local sponsor would agree to satisfy before commencement of project construction. Typically, these include provisions for cost-sharing, land easements and rights-of-way, designation of project components for which construction would solely be the responsibility of the local sponsor, and provisions for operations and maintenance. The current tentative Local Cooperation Agreement with the State of Ohio would require amendment to include mitigation features. A recent policy statement by the Office of the Chief of Engineers, [1] U.S. Army Corps of Engineers, indicates that inclusion of mitigation features as a local cooperation item provides an adequate mechanism for insuring that agreed upon local cooperation is performed by the local sponsor.

[1] Office of the Chief of Engineers, Policy Issue No. 80-25(b).

SECTION 5

PUBLIC INVOLVEMENT

PUBLIC INVOLVEMENT PROGRAM

5.01 Introduction - Study activities have been coordinated with appropriate Governmental agencies, local private clubs and associations, and the general public. Public participation has been encouraged through public meetings, coordination meetings and workshops, as well as media releases. During preparation of the Plan of Study (POS), and Stage 2 and 3 reports, five coordination meetings and a public meeting were held to keep the local sponsor, coordinating agencies, and concerned citizens informed of developments in the study and assess their views and input for incorporation into the planning process.

5.02 At the initial workshop meeting on 15 December 1977, the Ohio Department of Natural Resources (ODNR), the local sponsor for this project, voiced its opposition to elimination of any parking area due to construction of the authorized small-boat harbor and requested that the harbor be moved westward of its original location to prevent reduction in the size of the parking area. ODNR also stated that they were opposed to acquiring any additional land outside the boundaries of the State Park for a small-boat harbor. The USF&WS stated that agency would oppose any project that destroys the wetland area but that they would consider mitigative measures.

5.03 On 22 March 1978, a public meeting was held in Geneva, OH, to exchange information with the general public and insure a fully coordinated Plan of Study. Participants were given the opportunity to express their views on the project and to provide a sketch of the harbor they felt would best suit their needs. Statements made at this meeting indicated strong public support for construction of this project at the earliest possible time.

5.04 The completed Plan of Study and Stage 2 Document for this project were distributed to the political leaders in the area and to various local, State, and Federal agencies for their review and comment. Loan copies of the reports were also supplied to local libraries for review by the general public and various civic groups. In addition, until the supply was exhausted, personal copies were made available to study participants free of charge.

5.05 The second workshop meeting was held on 18 January 1979. The purpose of this workshop meeting was to review the results of the studies conducted to date for the small-boat harbor study and to come to a decision regarding which of eight preliminary harbor layouts prepared by the Buffalo District were acceptable to ODNR. As a result of this workshop meeting, four preliminary harbor layouts were eliminated from further consideration. ODNR suggested that Alternatives 5 and 6, both fair-weather harbors, be eliminated due to the State's need for a harbor-of-refuge at Geneva State Park. Also, due to their high costs, it was requested that Alternatives 7 and 8 (offshore harbors) not be considered further.

5.06 A third workshop meeting with ODNR and USF&WS was held on 29 May 1979 at the park. The purposes of this workshop were to discuss the preliminary layouts, designs, and costs that Buffalo District had prepared for the four alternative plans selected for further study with the principal agencies involved in the study, and to obtain a connsensus on the plan(s) to be carried into Stage 3 planning. ODNR stated that they would need additional time to study the construction and operating costs of each of the four alternatives before stating a preference. Therefore, no decision was made on the plans to be considered in Stage 3 at this workshop. USF&WS indicated a preference for a marina location outside the wetlands (Cowles Creek area); opposition to a plan where the marina would be located in the wetlands (Alternative 4); and a willingness to consider further two plans that would partially encroach into the wetlands (Alternative 2 and 3) provided mitigative measures were taken.

5.07 A fourth workshop meeting with ODNR and USF&WS was held at the park 26 June 1980, to review the four alternative harbor plans developed by the Buffalo District during its Stage 2 investigation and two alternative harbor plans developed by ODNR and to reach agreement on the plan(s) which should be recommended for further detailed study. In addition, once agreement was reached on the recommended harbor plan, a conceptual mitigation plan was to be developed. ODNR preferred Plan 3b, since it would provide 60 more slips than Plan 3a, and would also allow the conversion of the existing bathhouse into a dual purpose facility. USF&WS preferred Alternative 2 (Offshore/Onshore Harbor), but would support Plan 3b as the selected plan. A conceptual mitigation plan for Alternative Plan 3b was then developed. Details of the mitigation plan were agreed to by Corps and USF&WS personnel on 27 June 1980.

5.08 A fifth meeting with ODNR, U. S. Coast Guard, and local boating interests was held on 23 July 1980 in Austinburg, OH, to review the small-boat harbor alternative selected for additional detailed study and to consider specific channel width and depth requirements for power boats and sailboats. Six members of the local boating community as well as boating experts with the U. S. Coast Guard and ODNR agreed to channel dimensions that would be conformable to the expected fleet mix and would serve the needs of local boaters.

5.09 Due to the fact that the project area is within the boundaries of a State Park, and recent workshop meetings were held with study participants, and with local boating interests, and also due to the availability of the Stage 2 report to those interested, a Stage 2 public meeting was deemed not necessary.

5.10 A Public Notice and Preliminary Evaluation pursuant to Section 404(b) of the Clean Water Act (33 USC 1344) was distributed on 30 October 1980, notifying the public of their right to request a public hearing if there were interests which would be affected by the discharge of dredged and fill material into waters of the United States. No responses were received.

5.11 A public meeting was originally tentatively scheduled for summer 1981. This meeting has been waived because it is clearly not needed, since despite

extensive coordination which has already taken place, there have been virtually no expressions of disagreement or controversy. A news release distributed by the Buffalo District Corps of Engineers in July 1981, explained the waiver of the public meeting and the recommendations arrived at through the Stage 3 study.

REQUIRED COORDINATION

5.12 Coordination with U. S. Fish and Wildlife Service - Compliance with the Fish and Wildlife Coordination Act, as amended, 16 USC 661 et seq., and Endangered Species Act of 1973, as amended, 16 USC 1531 et seq. - These two laws require coordination with the U. S. Fish and Wildlife Service on matters of fish and wildlife resources and project effects on endangered species. Representatives of the Fish and Wildlife Service attended most of the meetings held by the Corps and ODNR during 1977 to 1980. The USF&WS has provided significant input into selecting alternative plans which would minimize the loss of wetland habitat and the development of a mitigation plan to make up for those losses. On 3 April 1980, the USF&WS provided a Four-Season Study (Exhibit G-2 in Appendix G) to provide a base for ecological assessment of areas that could be impacted by the proposed project. A final Fish and Wildlife Coordination Act Report, dated 21 January 1980 (Exhibit G-3 in Appendix G), was provided for the study. In a letter dated 9 October 1980 (Exhibit E-5 in Appendix E), the USF&WS stated that although the Indiana bat and bald eagle have ranges which include Ashtabula County, neither of these endangered species occurs at or near the project site.

5.13 Compliance with Executive Order 11990 - Protection of Wetlands, 24 May 1977 - This Executive Order requires that Federal agencies avoid development in wetlands unless no practicable alternative to such development exists. Nonwetland alternatives that were considered include an offshore harbor, sites other than Geneva State Park and dry storage plans. These alternatives were not considered implementible by State and local interests for economic and other pertinent reasons. The Corps has concluded, therefore, that there is no practicable alternative to construction within the wetland and that the proposed action includes all practicable measures to minimize harm to the wetlands which may result from such use. Those damages which are unavoidable will be compensated for through an approved mitigation plan including wetlands creation and maintenance.

5.14 Compliance with Executive Order 11988 - Flood Plain Management, 24 May 1977 - This Executive Order requires that Federal agencies avoid, to the maximum extent possible, long- and short-term adverse impacts associated with the occupation or modification of a base flood plain whenever there is a practicable alternative to such an action. Alternatives which would not involve siting within the 100-year flood plain of Lake Erie, offshore harbors and nonstructural dry storage plans, were examined but rejected due to a much higher cost and a failure to meet the planning objective for providing a harbor-of-refuge. The Corps has concluded, therefore, that there is no practicable alternative to the proposed action and that the recommended action is in conformance with the Flood Plain Management Executive Order.

5.15 Analysis of Impacts on Prime and Unique Farmlands, CEQ Memorandum, 30 August 1976 - This memorandum requires that an analysis of the effects of a proposed plan on prime and unique farmland be presented in the EIS. This analysis is based upon the presence of prime and unique farmland soils. The classification of particular soil types as prime or unique has been determined by the U.S. Department of Agriculture Soil Conservation Service. Consultation with that agency using published County Soil Survey reports has determined that there are no prime and unique farmland soils in the area which would be affected by the project. Therefore, the preferred plan for Geneva-on-the-Lake does not affect farmlands in any manner and this memorandum is complied with for the study.

5.16 Compliance with the Clean Water Act, 33 USC 1251 et seq. - The Clean Water Act requires that the effects of the placement of dredged or fill materials into the waters of the United States be evaluated and include consideration of the section 404(b)(1) guidelines as described in the Act. A preliminary Section 404 Evaluation was prepared and circulated with a public notice on 30 October 1980. Although the opportunity to request a public hearing to discuss Section 404 matters was given, the 30-day review period has passed without comment and no public hearing will be scheduled. The Section 404 evaluation, including input from Federal, State, and local agencies, and private citizens, has concluded that all appropriate measures have been identified and incorporated in the proposed plan to minimize its adverse effects on the aquatic environment. In accordance with Section 401 of the Act, a water quality certificate has been received from the Ohio Environmental Protection Agency.1/

5.17 Coastal Zone Management Act of 1972, 16 USC 1451 et seq. - Section 307 of the Coastal Zone Management (CZM) Act requires that activities significantly affecting land or water uses in the coastal zone of a State or territory must be coordinated with the appropriate State agency responsible for administering the State's approved coastal management plan. The State of Ohio's CZM plan is currently not finalized. The study has been and will continue to be fully coordinated with ODNR, the State agency responsible for preparation of the CZM Plan and no apparent conflicts have surfaced to date.

5.18 Cultural Resources - The requirements for identification and administration of cultural rsources are contained in various Federal laws, Executive Orders, and Guidelines. In accordance with the mandates on this legislation, a cultural resources reconnaissance was undertaken in the environmental impact area of the project. The study revealed that the project would not affect significant cultural resources. The report has been reviewed by the Heritage Conservation and Recreation Service and the Ohio State Historic Preservation Officer who agrees with the study findings. Completion of the above study and coordination has attained legislative compliance with the cultural resources legislation.2/

1/ Appendix F of the main report contains the public notice, the Preliminary and Final Section 404 Evaluation, and the Section 401 Water Quality Certificate.

2/ See Exhibit G-1 of Appendix G.

5.19 Clean Air Act, as amended, 42 USC 7609 - Copies of the Draft and Final Environmental Impact Statement were provided to the U. S. Environmental Protection Agency's (EPA) Regional Administrator, to obtain written views and comments on the environmental impact of any matter relating to EPA's authorities from the standpoint of public health or environmental quality under Section 309 of the Act, and the determinations and findings required by Section 176(c) of the Act to assure the conformity of the proposed action to the State's implementation plan.

5.20 Land and Water Conservation Fund Act, 16 USC 4601 et seq. and Federal Water Project Recreation Act, 16 USC 460-1-12 et seq. - Review copies of the main report and accompanying Environmental Impact Statement were provided to the Department of the Interior in regard to recreation and fish and wildlife activities for conformance with the comprehensive nationwide outdoor recreation plan formulated by the Secretary of the Interior.

5.21 National Environmental Policy Act, 42 USC 4321 et seq. - The National Environmental Policy Act of 1969 (NEPA) requires that the Draft and Final Environmental Impact Statement be circulated for review and comment to all Federal and State agencies having jurisdiction by law or special expertise with respect to any environmental impact involved, or which is authorized to develop and enforce environmental standards. Comments are also be requested from all other parties on the project mailing list and from State and local clearinghouses in accordance with OMB Circular A-95 (Revised). This FEIS, any comments received, and any underlying documents will be made available to the general public pursuant to the provisions of the Freedom of Information Act (5 USC 552).

PUBLIC VIEWS AND RESPONSES

5.22 Summary - The views of local interests in the Geneva-on-the-Lake area, as expressed at workshops and at a public meeting previously discussed, were relied on extensively during the study planning process. As indicated at the 22 March 1978, public meeting, public sentiment expressed regarding the proposed small-boat harbor have been entirely positive. Those who made comments at the meeting were unanimous in stating the need for a harbor facility at Geneva State Park. ODNR, the local cooperator, has been involved in the decision-making process since the study began. The State officials have expressed opposition to plans which greatly reduce the amount of parking area or require the acquisition of additional land. Due to the need for a harbor-of-refuge, ODNR has asked for the elimination of fair-weather harbor alternatives (Alternative 5 and 6). Alternatives 7 and 8 (offshore harbors) were also rejected because they would have a much higher cost than other alternative all-weather harbors. Although ODNR did not favor Alternative 1 (Cowles Creek) since it would isolate the bathhouse from swimming areas, it was retained because it was the alternative favored by the USF&WS. As stated earlier, the authorized project is located within the boundaries of an existing wetland area and its modification or elimination poses severe environmental concerns. For these reasons, the views and recommendations of the East Lansing Area Office of the USF&WS have been instrumental throughout the course of this study. USF&WS expressed opposition to the destruction of the existing wetland, but stated they would consider mitigation measures.

Where possible, their suggestions were incorporated into the four preliminary harbor layouts selected for Stage 2 study. The USF&WS preferred a marina location outside the marsh/swamp complex (Cowles Creek area) and were definitely opposed to Alternative 4 because the amount of wetland destruction caused could not be mitigated. Alternatives 2 and 3 which would encroach upon the wetlands would be acceptable provided a suitable mitigation plan was developed. The details of this plan were agreed to by the USF&WS on 27 June 1980. The recommendations of the U. S. Coast Guard and local boating interests were used in the estimation of the probable future fleet mix which in turn was used for the design of channel widths and depths.

STATEMENT RECIPIENTS

5.23 The following agencies, groups, and individuals were sent copies of the Draft and Final Phase I GDM and EIS for review and comment.

5.24 Federal

U. S. Department of Agriculture

U. S. Department of Commerce

U. S. Department of Energy

U. S. Department of Health and Human Services

U. S. Department of Historic Preservation

U. S. Department of Housing and Urban Development

U. S. Department of the Interior

U. S. Department of Transportation

U. S. Environmental Protection Agency

5.25 State

Office of the Governor

Ohio Department of Natural Resources

Ohio State Clearinghouse

5.26 Local

Ashtabula City Planning Commission

Ashtabula County Commissioner's Office

Ashtabula County Engineer

City of Geneva Council

City of Geneva Planning Commission

Eastgate Development and Transportation Agency

Geneva Area Chamber of Commerce

Geneva State Park

Geneva-on-the-Lake Council

Lake County Planning Commission

Lake County Board of County Commissioners

Lake Shore Marine Advisory Board

5.27 Legislative

Honorable Howard M. Metzenbaum, U. S. Senator

Honorable John Glenn, U. S. Senator

Honorable J. William Stanton, Representative in Congress

Honorable Marcus A. Roberto, Ohio Senator

Honorable Robert J. Boggs, Ohio Representative

Honorable James A. Rhodes, Governor

5.28 Organizations and Individuals

Copies of the Draft and Final GDM and EIS were sent to approximately 30 organizations and individuals who have participated in the planning process or who have requested a copy. Others on the project mailing list and, through press releases, the general public were informed of its availability in local libraries or upon request to the Buffalo District Office of the Corps of Engineers.

REVIEW OF THE DRAFT REFORMULATION PHASE I GDM AND DEIS

5.29 Filing of the DEIS - The Draft Reformulation Phase 1 GDM and DEIS were mailed to all known interested Federal, State, and local agencies as well as interested individuals in May 1981. At the same time, the reports were filed with the U. S. Environmental Protection Agency, initiating the 45-day official review period required under the National Environmental Policy Act (NEPA). Comments were accepted through July 1981. Copies of all comment letters on the draft reports with corresponding Corps responses are included in Appendix E of the Final Report appendices.

5.30 Public Views Since Release of the Draft Reformulation Phase I GDM and DEIS - From the general public, there has been no stated opposition, proposed modification, or overt demonstration of support for the recommended plan since release of the Draft Report. The U. S. Environmental Protection Agency expressed reservations because of the potential loss of wildlife habitat associated with the selected plan, but agrees that the proposed mitigation plan is a sound one. The National Oceanic and Atmospheric Administration is concerned about project-related effects upon shoreline process. For details of the agency opinions, the reader is referred to Appendix E of the Final Report appendices.

Index and References

Index and References (Cont'd)

APPENDIX A

GEOLOGY, SOILS, AND CONSTRUCTION MATERIALS

GENEVA-ON-THE-LAKE SMALL-BOAT HARBOR

FINAL REFORMULATION PHASE I GENERAL DESIGN MEMORANDUM

U.S. Army Engineer District, Buffalo
1776 Niagara Street
Buffalo, NY 14207

GENEVA-ON-THE-LAKE, OHIO

FINAL PHASE I REFORMULATION
GENERAL DESIGN MEMORANDUM

APPENDIX A
GEOLOGY, SOILS, AND CONSTRUCTION MATERIALS

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TABLES

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PLATES

REGIONAL GEOLOGY

A1. PHYSIOGRAPHY

Geneva-on-the-Lake, Ohio, is located within the eastern lake section of the Central Lowlands physiographic province. This area is characterized as having low relief transversed by east-west trending, gravelly ridges. Maximum relief occurs along the Lake Erie shoreline where steep bluffs of till and clay rise as high as 60 feet above the lake.

A2. BEDROCK

Bedrock underlying northeastern Ohio consists of Upper Devonian shale interstratified with a few siltstone beds. The Cleveland Shale of the Ohio Formation is exposed in western Ashtabula County and the Chagrin Formation is exposed in eastern Ashtabula County.

A3. STRUCTURAL GEOLOGY

The geologic structure of Ohio is relatively simple. In northeastern Ohio the dip is principally to the south. There are no major structures in the immediate area. The largest fold in Ohio is the north-plunging portion of the Cincinnati Arch which is called the Findlay Arch in the central portion of the State.

A4. SURFICIAL GEOLOGY

Most of northeastern Ohio consists of material deposited during the late Wisconsin. These deposits consist of till and stratified gravel, sand, silt, and clay. The lake escarpment Morainic System which forms a hummocky ridge about five miles south of Lake Erie consists mostly of till deposited within the last 14,000 years. Lakeward from the moraine are several ridges representing shorelines of former glacial Great Lakes. These ridges are about 10 feet high and consist of stratified sand and gravel. Near Ashtabula, the Whittlesey beaches reach a height of 70 feet. Towards the lake, the soils are clayey silt which are deposits of the former high level lakes and till.

A5. Recent deposits are beach sand along the lake and gravelly alluvium in the major streams.

A6. GROUND WATER

Nearly 80 percent of Ohio's ground water is from sand and gravel aquifers. The highest yields are derived from filled preglacial valleys which are linear north-south trending features.

LOCAL GEOLOGY

A7. BEDROCK GEOLOGY

Bedrock underlying the project site consists of shale of the Chagrin Formation. This is a greenish-gray shale interbedded with soft blue shale in its upper part, and is a blue-gray clay shale with thin layers of hard concretions in its lower section. Sand content increases eastward toward Pennsylvania. According to Cushing (1931), fragments of the rock readily crush to a powder with a hammer and on exposure it weathers very quickly to a soft sticky clay. The Chagrin Formation is about 1,200 feet in thickness.

A8. A seismic survey was performed to determine the bedrock surface at the project site. Results are shown on Plates A2 and A3. The configuration of the rock shows that it is relatively flat lying but cut by several channels. The major channel is about 500 feet wide, 20 feet deep, and trends in an east-west direction. This channel appears to be filled mostly with till and silt as shown on the auger logs. Top of rock varies from elevation of -20 to +10 feet LWD (568.6-IGLD).

A9. SURFICIAL GEOLOGY

The surficial deposits at the proposed project site consist of glacial till, glacial-fluvial gravel, and clayey silt. According to Gross and Moran (1971), till in this part of Ohio has a sand-silt-clay ratio of about 28/46/26, with occasional large boulders. Seismic refraction studies show that the till varies in thickness from 0 to 31 feet. Overlying the till are sand and gravel, silt, and fill. The fill is predominantly silt and was borrowed from the pond areas shown on Plate A4.

A10. SEDIMENTATION

As a result of the bank stabilization and offshore structures, sediment input will not be a problem on the selected alternative.

A11. GROUND WATER

Ground water was not encountered during augering at the project site in 1978 but is probably controlled by the Lake Erie water level. Some seepage in the excavations will occur at the top of the till because it is relatively impermeable and is overlain by more permeable beds.

SUBSURFACE INVESTIGATIONS

A12. PROGRAMS FOR EARLIER STUDIES

Subsurface programs for previous studies included a series of probings, soundings and Porter Sampler borings (Plate A1). During 1965, 32 probings were performed in the general area of the proposed small-boat harbor. Those probings were obtained using a 3/4-inch hexagonal rod and were driven to "refusal" with an eight-pound sledge hammer. A portable hand-held drill was

used to obtain 19 explorations (probes) that were drilled to "refusal." The term "refusal" was not defined in either of the above techniques.

A13. In 1966, three small diameter drive borings were obtained by use of a "Porter Sampler" to determine the visual classification of the overburden. No testing was performed. For the Shore Erosion Demonstration Project, 27 probes were performed in 1977 and 1978. Those probes generally were obtained offshore.

A14. PROGRAM FOR CURRENT STUDY

General

Subsurface investigations were performed in 1978 and consisted of a geophysical survey and auger borings. Surface investigations consisted of a bathymetric survey performed in 1979. The locations of the geophysical survey, auger borings, and bathymetric survey are shown on Plate A1.

A15. GEOPHYSICAL SURVEY

The survey consisted of 14 lines (approximately 11,000 linear feet) arranged over the general area to include the various alternative sites. The geophysical data was recorded by a 12-channel seismograph. The subsurface data was interpreted and geologic profiles were drawn along each seismic line.

A16. AUGER BORINGS

In order to provide some limited control for the seismic survey, eight auger borings were drilled to refusal.

A17. BATHYMETRIC SURVEY

Offshore soundings were recorded by the integrated sounding system in the summer of 1979 to -20 feet LWD (568.6-IGLD). The sounding lines were arranged over the general offshore area to include the various alternative sites. The data was plotted by computer and contour lines were drawn as shown on Plate A1.

A18. Grab samples were obtained during the offshore survey in 1979 using a Peterson Sampler. Sampling indicated an absence of sediment beyond the -3 foot LWD contour except in the vicinity of Cowles Creek where sediment extended to -9 LWD. Samples taken showed the sediments to be gravelly fine-to-medium sand with traces of silt and clay. Samples near the shoreline contained the greater percentage of coarse materials.

A19. DATA INTERPRETATION

Geologic classifications were made based on velocities shown in Table A1.

Table A1 - Geologic Classification Based on Velocity

Seismic Zone	Velocity Range (feet per second)	Geologic Material
I	1,050-2,500	Fill, alluvium, lake deposits or outwash
II	3,600-6,900	Glacial Till
III	7,000	Bedrock

A20. Probes, Porter Sampler borings, soundings, and auger borings were utilized to supplement data interpretation. The top of till and top of bedrock were contoured (Plates A2 and A3).

A21. The bedrock surface (Plate A3) interpreted from the seismic survey indicates the presence of an east-west trending valley that opens northward (lakeward). This valley is incised 10 feet into rock. Since the valley does not appear to follow any local or regional structure, it probably provided major drainage through the area before the last glaciation. The bedrock high of 0.0 feet (LWD) near the lake edge is below the present shoreline and may be the result of meander activity. A bathymetric map offshore of this channel indicates that the present lake bottom surface is superimposed on this feature, and the valley can be traced for several hundred yards offshore. The till surface (Plate A2) is irregular but follows the general trend of the bedrock. The till is thickest in the bedrock valley and thinner at the higher elevations. The irregularities of the till surface are masked by the lacustrine deposits of former glacial Great Lakes. The proposed harbor is situated to best utilize the existing glacial till and bedrock contours while minimizing the impact on parking areas and wetlands.

A22. Geologic sections have been prepared at four locations shown on Plate A4. The typical sections are shown on Plate A5.

GEOTECHNICAL DESIGN

A23. GENERAL

Presumptive values for soil and rock were used. The design for soil and bedrock cuts are conservative. For soil, the slopes are 1V on 3H; for bedrock, the cuts are vertical since they are stable and will remain underwater. Sand, gravel, and silt that overlie the glacial till should not be difficult to excavate. Seismic velocities of 3,000 to 6,700 feet per second indicate that the till is rippable, but in those areas where the velocities approach 6,700 feet per second, drilling and blasting may be required.

Typical seismic velocities of 7,000 to 14,000 feet per second indicate that the bedrock also is marginally rippable to nonrippable using a D9H ripper. Bedrock excavation probably will require drilling and blasting.

A24. <u>ENTRANCE CHANNEL</u>

Bedrock is assumed to be at or below grade in the entrance channel. A veneer of fine grained sand ranges in thickness up to four feet near the shoreline. Rock excavation may be required for the entrance channel in the lake and onshore.

A25. <u>INTERIOR CHANNELS AND MOORING AREAS</u>

A variety of overburden soil types will require excavation. Generally, bedrock is below grade; however, some excavation of bedrock will be required.

A26. <u>RETAINING WALL</u>

The proposed harbor will require a retaining wall (diaphragm cell being considered at this stage) in order to minimize encroachment in the parking lot. These walls will be founded on rock.

A27. <u>BREAKWATERS AND FOUNDATIONS</u>

Relatively favorable geotechnical conditions exist at the project site regarding construction of the breakwaters. Foundations are assumed to be sands and shales with bedrock disclosed at or near the lake bottom throughout the site overlain by primarily drifting sands. There are assumed to be no significant deposits of weak, soft compressible materials. <u>Compatibility of Internal Zonation</u> - The stone sizes presented in this report are based on criteria from the Shore Protection Manual (SPM). Therefore, suitable compatibility exists between internal zones. <u>Foundation Evaluation</u> - The loose sands lying along the shoreline constitute the foundation for the breakwaters. Exceptions to this would be those locations where bedrock forms the founding stratum. In both cases, bedrock ultimately supports the structures. Immediate minimal consolidation of the sand is expected with no long-term settlement. Prevention of toe scour due to wave action is required. Therefore, a berm has been designed outward from the toe of the structures (see Plate A4). Four different bedding layers for different portions of the breakwaters were selected by procedures outlined in the SPM. The bedding layers are of sufficient minimum thickness (2 to 3 feet) to assure its effectiveness. It is impossible to completely eliminate the movement of fines through the toe due to wave action. However, favorable bottom conditions (fine-to-medium sands) and the proposed bedding layers should minimize the problem.

A28. <u>SLOPE PROTECTION DESIGN</u>

Mooring area and channel side slopes in overburden will require slope protection. A maximum of 1-foot wave heights are anticipated within the mooring basin. Therefore, a 12-inch-layer riprap over a bedding/filter will be adequate. Computation for both riprap and bedding/filter are shown on the following pages.

A29. WATER CONTROL STRUCTURE AND IMPERVIOUS LEVEE

In order to retain and enhance the existing wetlands, it is necessary to control drainage west of the proposed harbor. This will be accomplished by a water control structure near the shore tied into an impervious levee along the west wall of the harbor. Locations and typical sections are shown on Plate A4.

CONSTRUCTION MATERIALS

A30. GENERAL

A materials survey was performed in October 1980 to determine possible sources for Geneva-on-the-Lake Small Boat Harbor. The survey consisted of a file

BY CJL DATE 1 OCT 80 SUBJECT GENEVA ON THE LAKE, OH SHEET NO. .... OF ....
CHKD. BY .... DATE .... RIPRAP FOR SMALL BOAT HARBOR JOB NO. ....

ASSUMPTIONS FOR RIPRAP DESIGN

1. MAXIMUM WAVE HEIGHT INSIDE MOORING BASIN : 1 FOOT
2. SPECIFIC GRAVITY OF STONE MATERIAL : 2.48 (155 pcf)
3. DESIGN SLOPE : 1V ON 3H
4. NONBREAKING WAVE
5. GRADED ANGULAR STONE : $K_{RR} = 2.5$

FROM "SHORE PROTECTION MANUAL" PAGE 7-175

$$W_{50} = \frac{W_R H^3}{K_{RR}(S_R - 1)^3 \cot \theta}$$

WHERE: $\cot \theta = 3$
$W_R = 155$ pcf
$H = 1$ FOOT
$S_r = 2.48$

$$W_{50} = \frac{(155 \times 1)^3}{2.5(2.48-1)^3(3)}$$

$W_{50} = 6.38$ POUNDS → SAY 7 POUNDS

$W_{max} = 3.6 W_{50}$

$W_{max} = 3.6(6.38$ POUNDS$)$

$W_{max} = 22.96$ POUNDS → SAY 23 POUNDS

$W_{min} = 0.22 W_{50}$

$W_{min} = 0.22(6.38$ POUNDS$)$

$W_{min} = 1.40$ POUNDS → SAY 1.5 POUNDS

FROM ETL 1110-2-60 PAGE 6: MINIMUM STONE LAYER THICKNESS FOR PRACTICAL PLACEMENT IS 12 INCHES.

FROM ETL 1110-2-120 PAGE 2 OF 7:

SPECIFIC WEIGHT = 155 pcf ; THICKNESS = 12 INCHES

PERCENT LIGHTER BY WEIGHT	LIMITS OF STONE WEIGHT IN POUNDS
100	61 - 32
50	24 - 16
15	12 - 5

BY G.J.L. DATE 1 OCT 80 SUBJECT GENEVA-ON-THE-LAKE, OH SHEET NO. ...... OF ......
CHKD. BY ...... DATE ...... BEDDING/FILTER FOR STONE PROTECTION JOB NO. ......

ASSUMPTIONS FOR BEDDING DESIGN:

1. SILTY CLAY SOIL $D_{85(S)} = 0.04\,mm$
   $D_{50(S)} = 0.01\,mm$
   $D_{15(S)} = 0.004\,mm$

2. GRADED RIPRAP $W_{50} = 20^{\#} \Rightarrow D_{50(R)} = 8''$ $W_{85} = 46^{\#} \Rightarrow D_{85(R)} = 10''$
   $W_{15} = 9^{\#} \Rightarrow D_{15(R)} = 6''$

BEDDING DESIGN CRITERIA PER EM 1110-2-1901 FOR SINGLE LAYER:

$$\left.\begin{array}{l} 1)\ \dfrac{D_{15(R)}}{D_{15(B)}} \geq 5 \\[2ex] 2)\ \dfrac{D_{15(B)}}{D_{15(S)}} \geq 5 \end{array}\right\} \text{TO PREVENT BLOCKAGE}$$

$$\left.\begin{array}{l} 3)\ \dfrac{D_{15(R)}}{D_{85(B)}} \leq 5 \\[2ex] 4)\ \dfrac{D_{15(B)}}{D_{85(S)}} \leq 5 \end{array}\right\} \text{TO PREVENT MIGRATION}$$

1) $D_{15(B)} \leq \dfrac{D_{15(R)}}{5} = \dfrac{6''}{5} \Rightarrow D_{15(B)} \leq 1.2''$

2) $D_{15(B)} \geq 5 D_{15(S)} = 5(0.004\,mm) \Rightarrow D_{15(B)} \geq 0.02\,mm$

3) $D_{85(B)} \geq \dfrac{D_{15(R)}}{5} = \dfrac{6''}{5} \Rightarrow D_{85(B)} \geq 1.2''$

4) $D_{15(B)} \leq 5 D_{85(S)} = 5(0.04\,mm) \Rightarrow D_{15(B)} \leq 0.2\,mm$

SIEVE DESIGNATION U.S. STANDARD SQUARE MESH	PERCENT FINER BY WEIGHT
4 INCH	100
2 INCH	70-100
1 INCH	60-83
1/2 INCH	53-76
NO. 4	44-67
NO. 16	32-55
NO. 40	23-44
NO. 100	10-25
NO. 200	0-10

search and communication with suppliers in which the following were considered: An analysis of the results of quarry investigations, an analysis of laboratory test results, the evaluation of available service records, and the determination of interest in producing required materials on the part of the quarry/pit operators.

A31. MATERIAL TYPES AND GRADATIONS

Stone materials required for the proposed design consist of armor, underlayer, and bedding for the shore-connected breakwaters, riprap and bedding for slope protection, and aggregates for concrete for the diaphragm cell retaining wall.

A32. ARMOR STONE

For the proposed design, a range of armor stone sizes is required as described below:

Item	Size
Armor Stone (Head) Type A1	6.5-15 tons
Armor Stone (Head) Type A2	3-6.5 tons
Armor Stone (Trunk) Type A3	1.5-3 tons
Armor Stone (Trunk) Type A4	0.5-1.5 tons

A33. UNDERLAYER STONE

For the proposed design, a range of underlayer stone sizes is required as described below:

Item	Size
Underlayer Stone (Head) Type U1	0.5-1.5 tons
Underlayer Stone (Head) Type U2	400-1,300 lbs
Underlayer Stone (Trunk) Type U3	200-600 lbs
Underlayer Stone (Trunk) Type U4	70-250 lbs

A34. BEDDING STONE

For the proposed design, a range of bedding stone sizes is required as described below:

Item	Size
Bedding Stone (Head) Type B1	2-150 lbs
Bedding Stone (Head) Type B2	1-60 lbs
Bedding Stone (Trunk) Type B3	0.5-30 lbs
Bedding Stone (Trunk) Type B4	0.2-11 lbs

A35. The least dimension of any piece of armor or any stone over 2 tons shall be not less than one-third of its greatest dimension. Underlayer or bedding material smaller than 2 tons may contain up to 15 percent elongated pieces.

A36. TWELVE-INCH LAYER RIPRAP

This stone will consist of a reasonably well-graded material having the following gradation and shall fall within the limits of the gradation band shown on Figure A1.

Percent Lighter by Weight	Limits of Stone Weights in Pounds	Quantity
100	81-32	
50	24-16	
15	12-5	
5	10-3.5	

A37. BEDDING/FILTER MATERIAL

This stone material will consist of a reasonably well-graded material having the following gradation and shall fall within the limits of the gradation band shown on Figure A2.

Sieve Designation U. S. Standard Square Mesh	Percent Finer by Weight
4-inch	100
2-inch	70-100
1-inch	60-83
1/2-inch	53-76
No. 4	44-67
No. 16	32-55
No. 40	23-44
No. 100	10-25
No. 200	0-10

A38. Riprap and bedding filter stone shall be predominantly angular in shape. Not more than 25 percent of the stones reasonably well distributed throughout the gradation shall have a length more than 2.5 times the breadth or thickness. No stone shall have a length exceeding 3.0 times its breadth or thickness.

A39. COARSE AGGREGATE FOR CONCRETE

This stone material will consist of a reasonably well-graded aggregate having the following gradation and shall fall within the limits of the gradation band shown on Figure A3.

Sieve Designation U. S. Standard Square Mesh	Percent Finer by Weight
1-1/2-inch	100
1- inch	95-100
1/2-inch	25- 60
No. 4	0- 10
No. 8	0- 5

A40. FINE AGGREGATE FOR CONCRETE

This stone material will consist of a reasonably well-graded aggregate having the following gradation and shall fall within the limits of the gradation band shown on Figures A4 or A5.

Sieve Designation U. S. Standard Square Mesh	Percent Finer by Weight Natural Sand	Manufactured Sand
3/8-inch	100	
No. 4	95-100	100
No. 8	70-95	90-100
No. 16	45-80	50-75
No. 30	25-60	30-60
No. 50	10-30	14-30
No. 100	1-10	4-12
No. 200	0-4	0-5

A41. Although armor stone, underlayer stone, bedding stone, graded riprap and randomly graded materials are not standard production items for most stone suppliers, most of the sources have produced similar materials in the past. Contractors will be required to provide the selected sources adequate lead time to produce the various products. Some of the suppliers may require the Contractor to do his own sorting and blending in order to obtain the proper gradations for riprap. As several similar projects could be under construction at the same time as Geneva-on-the-Lake, the Contractor will be permitted to propose more than one source for each or any of the products required.

A42. SPECIFIC GRAVITY OF STONE MATERIALS

A specific gravity of 2.48 (155 pcf) was used to compute the stone sizes for the five stone types. A variation in specific gravity equal to ±5 percent (2.36 to 2.60) is acceptable. It will be necessary to redesign stone sizes for any source used having a stone material whose specific gravity is not 2.48 ±5 percent

MATERIAL QUALITY

A43. GENERAL

Quality requirements for each material type are discussed below. Armor stone, underlayer, bedding, and riprap samples have been subjected to a series of tests established by the Ohio River Division Laboratories, Cincinnati, OH. Test number P-9, "Riprap and Breakwater Stone Evaluation," includes a series of tests to determine stone durability. The smaller sizes (i.e. bedding/filter material, and coarse and fine aggregates for concrete) have been subjected to a series of tests included in ORDL test numbers C-21 and C-22, "Elementary Acceptance Tests for Fine Aggregates (C-21) and Coarse Aggregates (C-22) for Civil Works."

A44. ARMOR, UNDERLAYER, BEDDING, AND RIPRAP

These stones will be a hard, durable, non-soluble material, free from visual cracks, seams, and overburden spoil. Only those sources from which the samples did not show any significant breakdown during the wet-dry and freeze-thaw tests are suitable. The wet-dry tests were performed for 80 cycles and the freeze-thaw tests for 35 cycles.

A45. BEDDING/FILTER

These stones will be a hard, durable, non-soluble material which is sound, free from visible cracks, seams, organic or deleterious material, and overburden spoil. Listed sources were subjected to tests such as the Los Angeles abrasion, magnesium sulfate loss, specific gravity and absorption, and a petrographic examination. Only suitable sources are listed.

A46. COARSE AND FINE AGGREGATES FOR CONCRETE

These materials will be a sound, hard, durable material, that is produced from a crushed product and shall be free from cracks, seams, organic, and deleterious materials. Aggregates that contain five percent or more of potentially reactive chert will require low alkali cement. Aggregates that contain a combined total of 20 percent or more of potentially reactive chert will not be permitted. Coarse aggregates will contain fractured sharp faces, and shall be free of laitence (washing of coarse aggregates may be required). Fine aggregates may be either natural sand (lake, beach, or glacial) or manufactured sand (crushed dolomite, limestone, or crushed conglomerates).

POSSIBLE SOURCES

A47. GENERAL

Armor stone, underlayer stone, bedding stone, riprap, bedding/filter, coarse and fine aggregate for concrete can be produced from those sources listed on Plates A6 and A7. However, all material from those sources may not be suitable. The right will be reserved in the specifications to reject materials from certain localized areas, zones, strata, channels, or stockpiles, when such materials become unsuitable.

A48. It is anticipated that selective quarrying will be required for armor stone, underlayer stone, and riprap. Blasting techniques used for normal aggregate production may require adjustments or, in some cases, complete tailoring to produce large size materials. Also, the specifications will require that shale and other undesirable materials will be excluded by suitable and adequate processing. Only specific ledges and in some cases specific beds are suitable for the production of armor stone, underlayer stone, and riprap. The following presents quarries, lifts, materials produced, and where those materials were used.

A49. QUALITY QUARRIES

Quarry at Kelleys Island, OH. (Lucas and Amherstburg Dolomite) Lift 1. This lift produced 10-20 ton armor stone for the Buffalo Harbor confined Diked Disposal Area No. 4. The lower chert horizons in this lift were not acceptable. Lift 1A and the upper part of Lift 2 has been used to produce 12-24 ton armor stone for the Cleveland Harbor, OH, Confined Diked Disposal Area No. 14.

A50. STANDARD SLAG CO.

Marblehead Stone Division Quarry at Marblehead, OH (Lucas and Amherstburg Dolomite). This quarry operated three lifts. Lift 2 is the current top lift. It contains an abundance of chert and is not acceptable for any stone type for this project. Lift 3 is about 50 feet high and contains a variety of dolomites. The uppermost bed, unit 17, has been used successfully to produce a wide range of sizes, especially armor stone. Lift MH-1 is a low bench operation that has successfully produced armor stone for the Lorain Harbor, OH, Confined Diked Disposal Facility.

A51. In addition to armor stone, Marblehead Stone Division has produced core stone for Erie Harbor, PA, Diked Disposal Area; Cleveland Harbor, OH, Diked Disposal Areas 1, 2, 12, and 14; Lorain Diked Disposal Area, and Huron Diked Disposal Area. They have produced underlayer material for Erie Harbor, PA, Diked Disposal Area; Cleveland Harbor, OH, Diked Disposal Areas 2, 3, and 12; Lorain Harbor, OH, Diked Disposal Area; and Huron Harbor, OH, Diked Disposal Area. Filter stone also was produced by Marblehead Stone Division for Erie, Cleveland (1, 2, and 12) Lorain and Huron Diked Disposal Areas. Concrete aggregates from Marblehead Stone Division were obtained for Cleveland Harbor, OH, Dike 14, and for the West Breakwater repairs.

A52. FRONTIER STONE PRODUCTS CO.

Quarry at Lockport, NY (Lockport Dolomite). For the purposes of materials surveys this quarry has been subdivided into units. All units are within the Lockport Dolomite. Units 1 through 9 are in the Goat Island Member (34 feet), units below are in the Gasport Member. The Gasport Member is subdivided into three units FG-1 (top), FG-2, FG-3 (bottom). The Gasport is about 12 feet thick. The DeCew Member is present in its full thickness but it is not acceptable for any materials to be used in this project.

A53. Armor stone ranging in size from 10 to 20 tons was produced from the Gasport Member for the Buffalo Harbor, NY, Confined Diked Disposal Area 4. Underlayer material ranging in size from 1,000 to 4,500 pounds also was produced from the Gasport Member for Buffalo Dike 4. Riprap (12 and 18-in) was produced from the Gasport Member for the Scajaquada Creek Flood Control Project. Riprap produced from the Goat Island Member for Scajaquada Creek Flood Project was rejected.

A54. This quarry also produces concrete aggregates and other crushed, graded products. The aggregates have been tested by ORDL and were found to be

satisfactory. To date, concrete aggregates have not been used by the Corps of Engineers for any project. Concrete aggregates are approved for use by the NYSDOT.

A55. MEDINA SANDSTONE CO.

Quarry at Hulberton, NY. This quarry produces large material for use as cut stone. The quarry successfully produced 10-20 ton armor stone for the Buffalo Harbor Confined Diked Disposal Area 4. Large armor stone also was produced for channel breakwater construction at Oak Orchard Harbor, NY. Jetty stone also was successfully produced for Hamlin Beach, NY protection (groins) from this source.

A56. Concrete aggregates formerly were produced from this source; however, the quarry no longer produces aggregates or any other crushed products.

A57. ERIE BLACKTOP, INC.

Quarry at Castalia, OH, (Columbus Limestone). This quarry has produced riprap (200 pounds minus) for State Route 231 near Ashtabula, OH, and underlayer materials for the Lorain Harbor, OH, Confined Diked Disposal Facility. Crushed products are produced for blacktop operations. However, the Corps of Engineers has not tested or used crushed materials from this source.

A58. E. KRAEMER AND SON, INC.

Quarry at Clay Center, OH, (Niagaran Dolomite). This quarry operates two lifts; the upper lift is about 80 feet high; the lower lift is about 20 feet high. Stone materials for the Lakeview Park Beach Improvement (160-1,200 pounds) and Erosion Control Project, Lorain, OH, were successfully produced from the lower lift. However, selective loading is required as the upper part of the lower lift contains "reef rock" and that rock is highly fractured and is not acceptable for use for this project.

A59. WOODVILLE LIME AND CHEMICAL CO.

Quarry at Woodville, OH, (Niagaran Dolomite). This quarry operates one 80-foot high lift. The quarry produced successfully 12 and 21-inch riprap for the Sandusky River Flood Control Project at Fremont, OH. Bedding and a manufactured fine aggregate for concrete also was produced for the Fremont Project. Core stone and 1-3 ton armor stone for the Pilot Dike Disposal Area (Dike No. 1), Cleveland, OH, was produced by this source.

A60. SANDUSKY CRUSHED STONE CO.

Quarry at Parkertown,OH, (Delaware Dolomite and Columbus Limestone). This source successfully produced 12 and 18-inch riprap for repairs to the Fremont Flood Control project. They produced cell fill material for the Huron Harbor, OH, Confined Diked Disposal Area. In addition, they furnished concrete aggregates for local ready-mix plants. Concrete placed at Huron Harbor Dike contains aggregates from this source.

A61. U. S. STEEL CORPORATION

Quarry at Cedarville, MI, (Engadine Formation) and quarry at Rogers City, MI, (Dundee and Rogers City Formation). Both sources contain loading facilities for self-unloading lake vessels. Rogers City quarry has furnished core stone material for the Diked Disposal Areas at Lorain Harbor, OH, and Cleveland Harbor, OH, (Dikes 2, 12, and 14). U. S. Steel has informed the Buffalo District that the maximum size material they will ship by vessel is 6 inches. Materials larger than 6 inches are of no interest to them.

A62. INLAND LIME AND STONE CO.

Quarry at Gulliver, MI, (Engadine Formation). This quarry also possesses loading facilities for self-unloading vessels. This source successfully produced cell fill material for the Huron Harbor, OH, Confined Diked Dredge Disposal Area.

A63. ERIE SAND AND GRAVEL, INC.

Erie, PA, (Dredged Lake Sand). Erie Sand and Gravel, Inc. has produced a fine aggregate for concrete for use at the Erie Harbor, PA, Confined Diked Dredge Disosal Area. However, recent test requests indicate that this sand contains about 19 percent chert, 6 percent of which is potentially chemically reactive with cement. Therefore, low alkali cement is required if this sand is used for concrete.

A64. R. W. SIDLEY, INC.

Quarry at Thompson, OH, (Sharon Conglomerate). Fine aggregate from this source contains about 96 percent silica and 4 percent sandstone and siltstone. Concrete materials are supplied to local ready-mix plants.

A65. CLEVELAND QUARRIES

Quarry at South Amherst, Ohio (Berea Sandstone). This quarry has produced cover stone for a number of annual repair contracts for Cleveland East Breakwater, Cleveland, OH. The quarry was also a source of derrick stone for the Wellsville Flood Control Project, Wellsville, NY.

A66. BOYAS EXCAVATING CO., MATERIALS DIVISION

Quarry at Garfield Heights, Ohio (Euclid Sandstone Lentil of the Bedford Shale). This quarry has produced large riprap for the repair project of Eastlake, OH and armor stone for the Cleveland Confined Dike Disposal Area No. 14.

A67. B. G. HOADLEY QUARRIES

Quarry at Bloomington, Indiana (Salem Limestone). This quarry has produced armor stone for the Confined Dike Disposal Area at Lorain.

A68. INDIANA LIMESTONE CO.

Quarry near Bedford, Indiana (Salem Limestone). This quarry has produced armor stone for Lorain Dike.

A69. VICTOR OOLITIC STONE CO.

Quarry at Bloomington, Indiana (Salem Limestone). This quarry has produced armor stone for the Confined Dike Disposal Area at Lorain.

A70. WOOLERY STONE CO.

Quarry at Bloomington, Indiana (Salem Limestone). This quarry has produced armor stone for the Confined Dike Disposal Area at Lorain.

A71. For some quarries, selective quarrying, loading, and handling will be required. This will affect production and might become a problem. Only two known sources possess grizzly equipment for the production of riprap, i.e., Standard Slag Co., Marblehead Stone Division at Marblehead, OH, and Sandusky Crushed Stone, Inc., at Parkertown, OH. The Woodville Lime and Chemical Co., at Woodville, OH, produces a 12-inch "Kiln Stone" for the steel industry. That material was used successfully for 12-inch riprap at Fremont, OH, Flood Control Project.

A72. Concrete aggregates are available from nearby ready-mix plants. Most of these plants obtain their aggregates from the northwestern sources via rail or self-unloading vessels.

A73. SUMMARY OF SOURCES

Armor Stone - Ten suitable sources are available within 360 miles of the project.

Underlayer Stone - Eight suitable sources are available within 180 miles of the project.

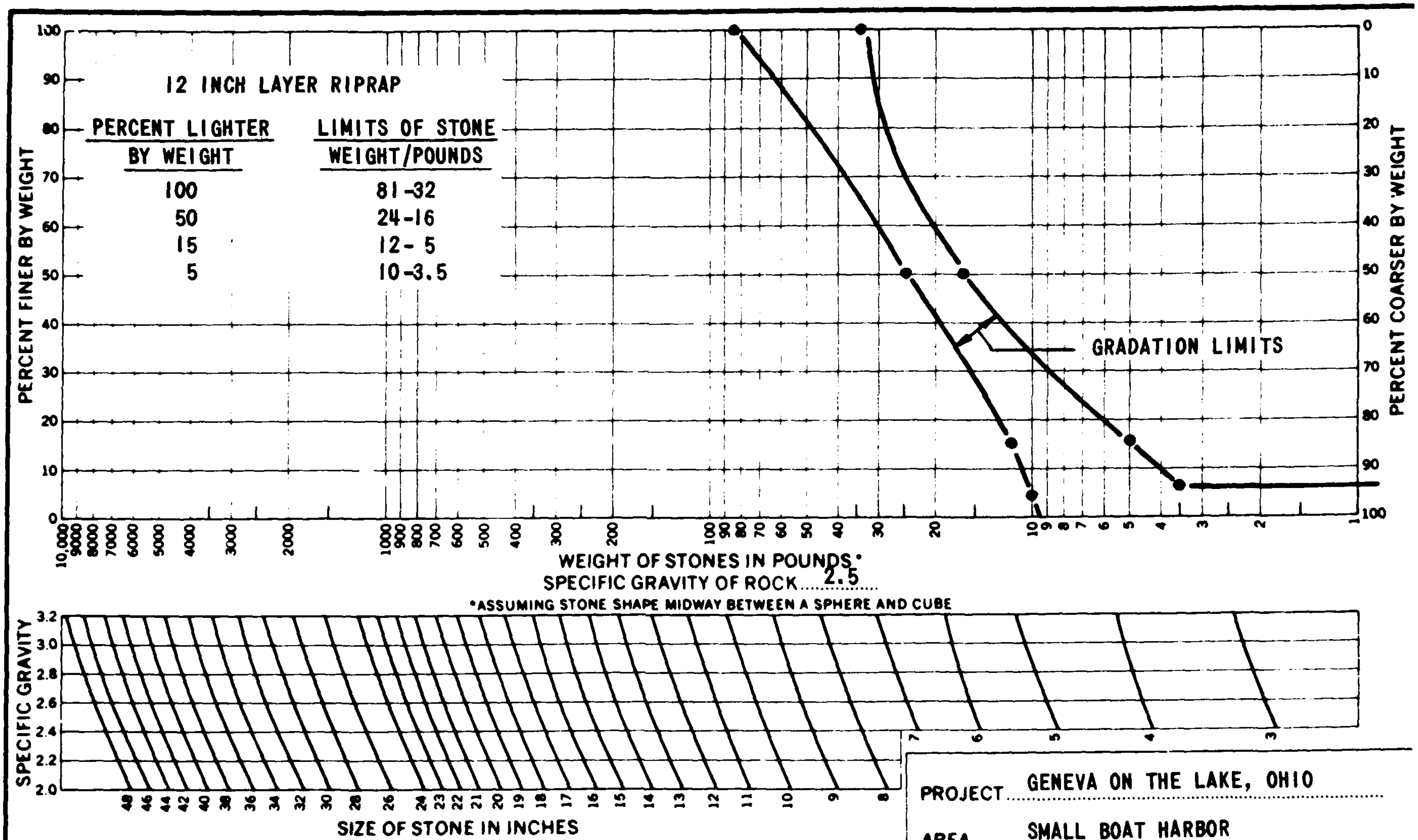
Bedding Stone - Eight suitable sources are available within 380 miles of the project.

Riprap - Nine suitable sources are available within 150 miles of the project.

Bedding/Filter - Eight suitable sources are available within 150 miles of the project.

Coarse Aggregates - Four suitable sources are available within 150 miles of the project.

Fine Aggregates - Two suitable sources are available within 60 miles of the project.



12 INCH LAYER RIPRAP

PERCENT LIGHTER BY WEIGHT	LIMITS OF STONE WEIGHT/POUNDS
100	81-32
50	24-16
15	12-5
5	10-3.5

PROJECT GENEVA ON THE LAKE, OHIO

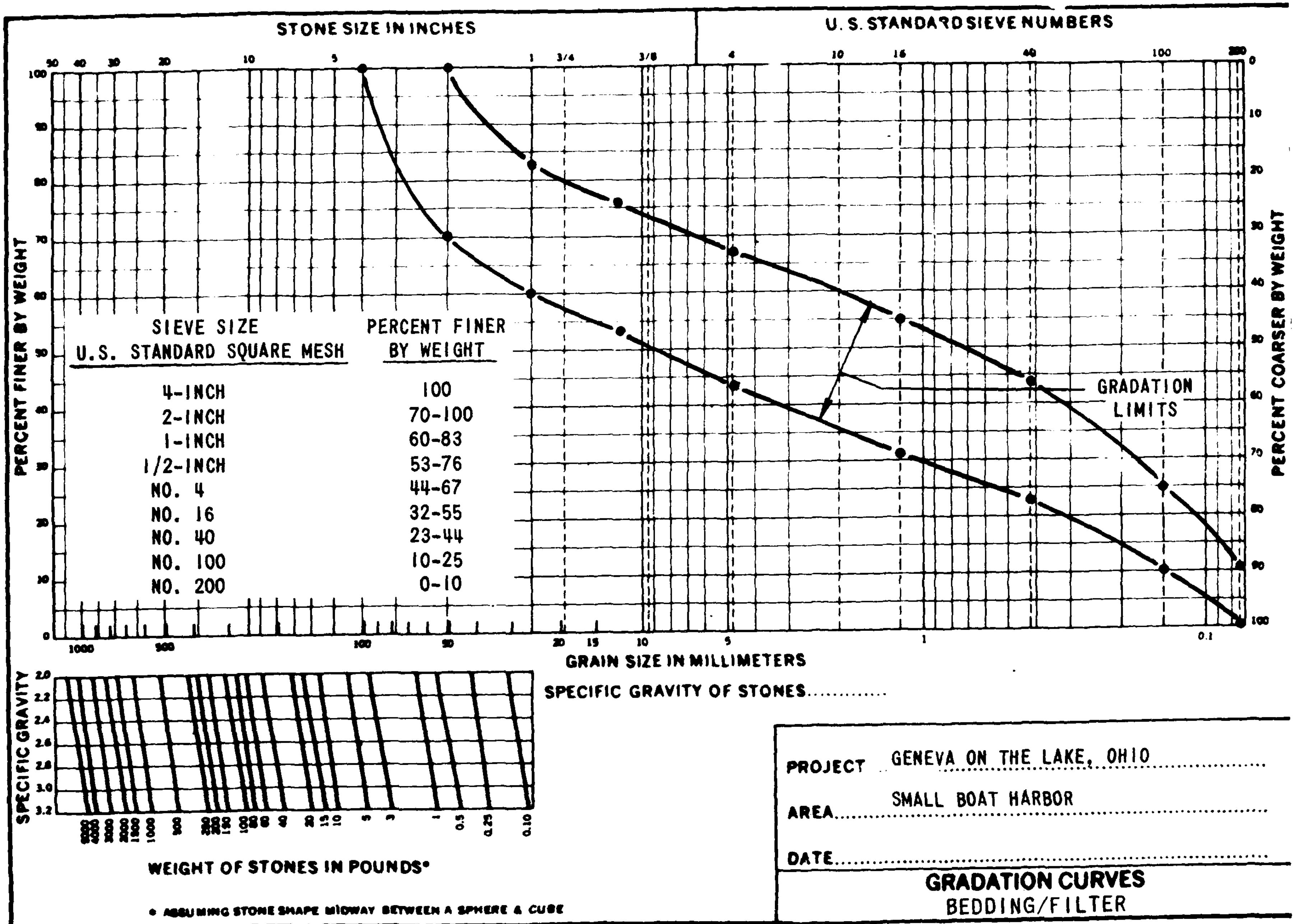
AREA SMALL BOAT HARBOR

DATE

12 INCH RIPRAP GRADATION CURVES

ENG FORM 4055
APR 67

FIGURE A1



SIEVE SIZE U.S. STANDARD SQUARE MESH	PERCENT FINER BY WEIGHT
4-INCH	100
2-INCH	70-100
1-INCH	60-83
1/2-INCH	53-76
NO. 4	44-67
NO. 16	32-55
NO. 40	23-44
NO. 100	10-25
NO. 200	0-10

SPECIFIC GRAVITY OF STONES............

PROJECT GENEVA ON THE LAKE, OHIO

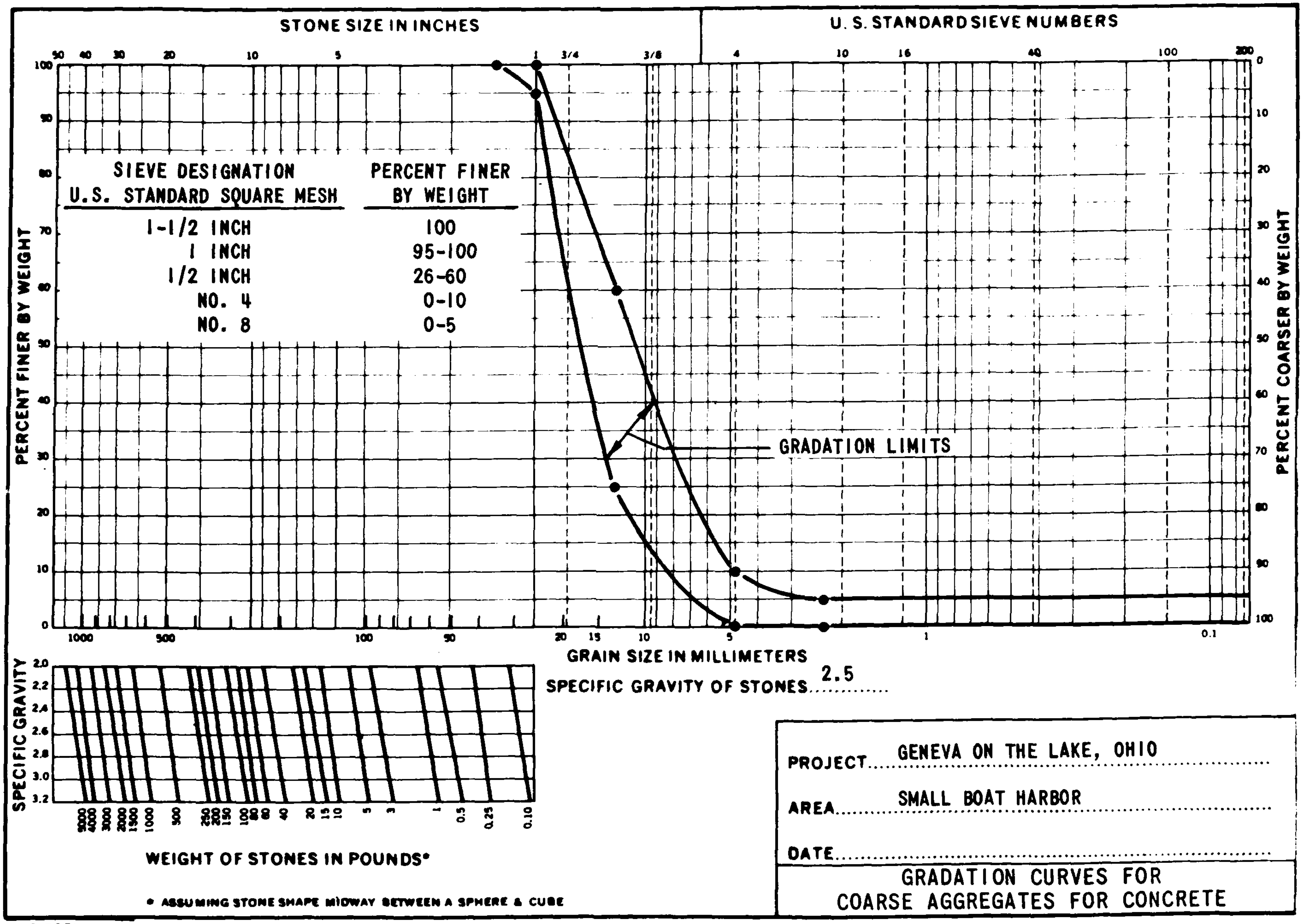
AREA SMALL BOAT HARBOR

DATE

GRADATION CURVES
BEDDING/FILTER

ENG FORM 4056
APR 67

FIGURE A2

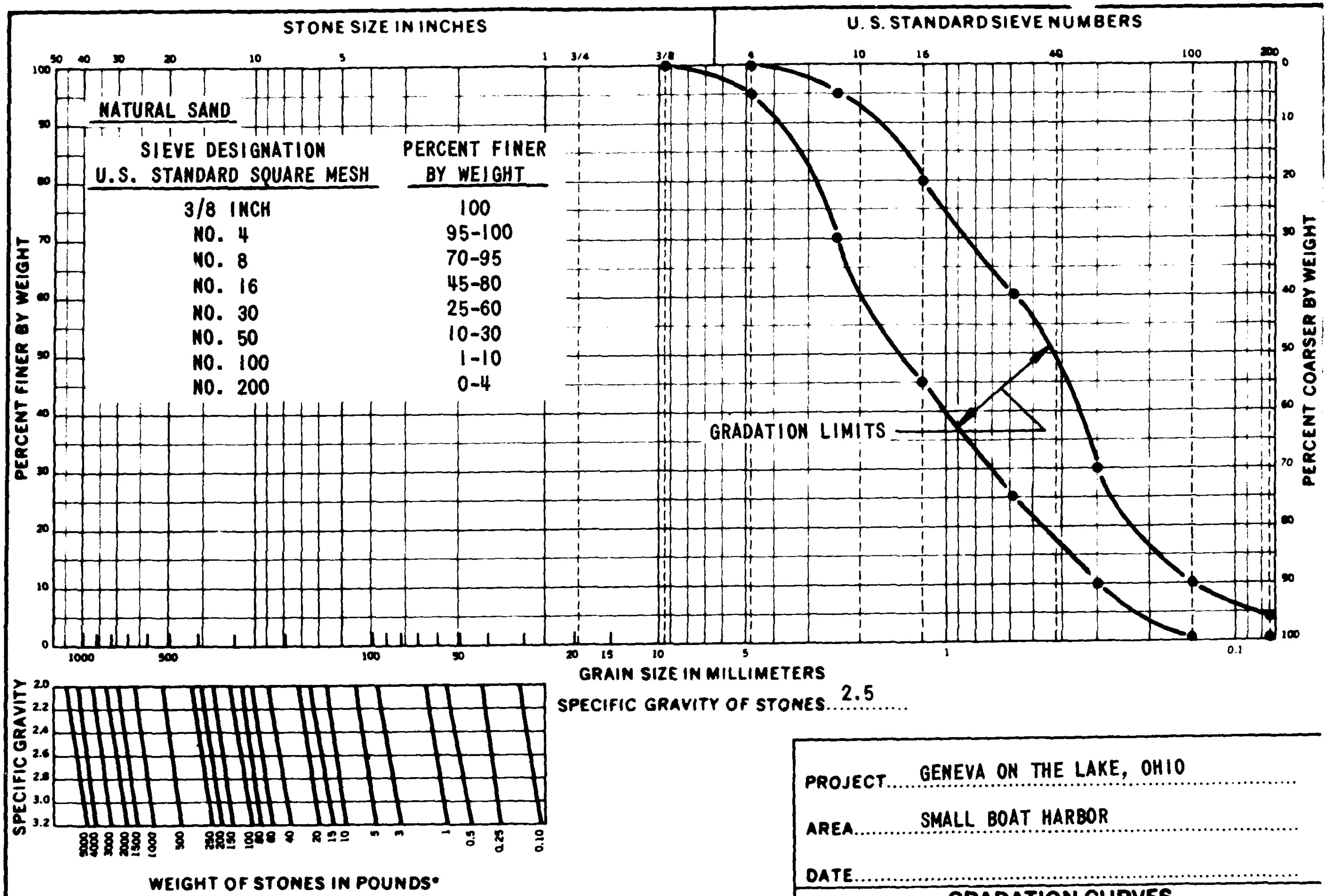


SIEVE DESIGNATION U.S. STANDARD SQUARE MESH	PERCENT FINER BY WEIGHT
1-1/2 INCH	100
1 INCH	95-100
1/2 INCH	26-60
NO. 4	0-10
NO. 8	0-5

GRADATION CURVES FOR COARSE AGGREGATES FOR CONCRETE

ENG FORM 4056 APR 67

FIGURE A3



NATURAL SAND

SIEVE DESIGNATION U.S. STANDARD SQUARE MESH	PERCENT FINER BY WEIGHT
3/8 INCH	100
NO. 4	95-100
NO. 8	70-95
NO. 16	45-80
NO. 30	25-60
NO. 50	10-30
NO. 100	1-10
NO. 200	0-4

SPECIFIC GRAVITY OF STONES 2.5

* ASSUMING STONE SHAPE MIDWAY BETWEEN A SPHERE & CUBE

PROJECT GENEVA ON THE LAKE, OHIO

AREA SMALL BOAT HARBOR

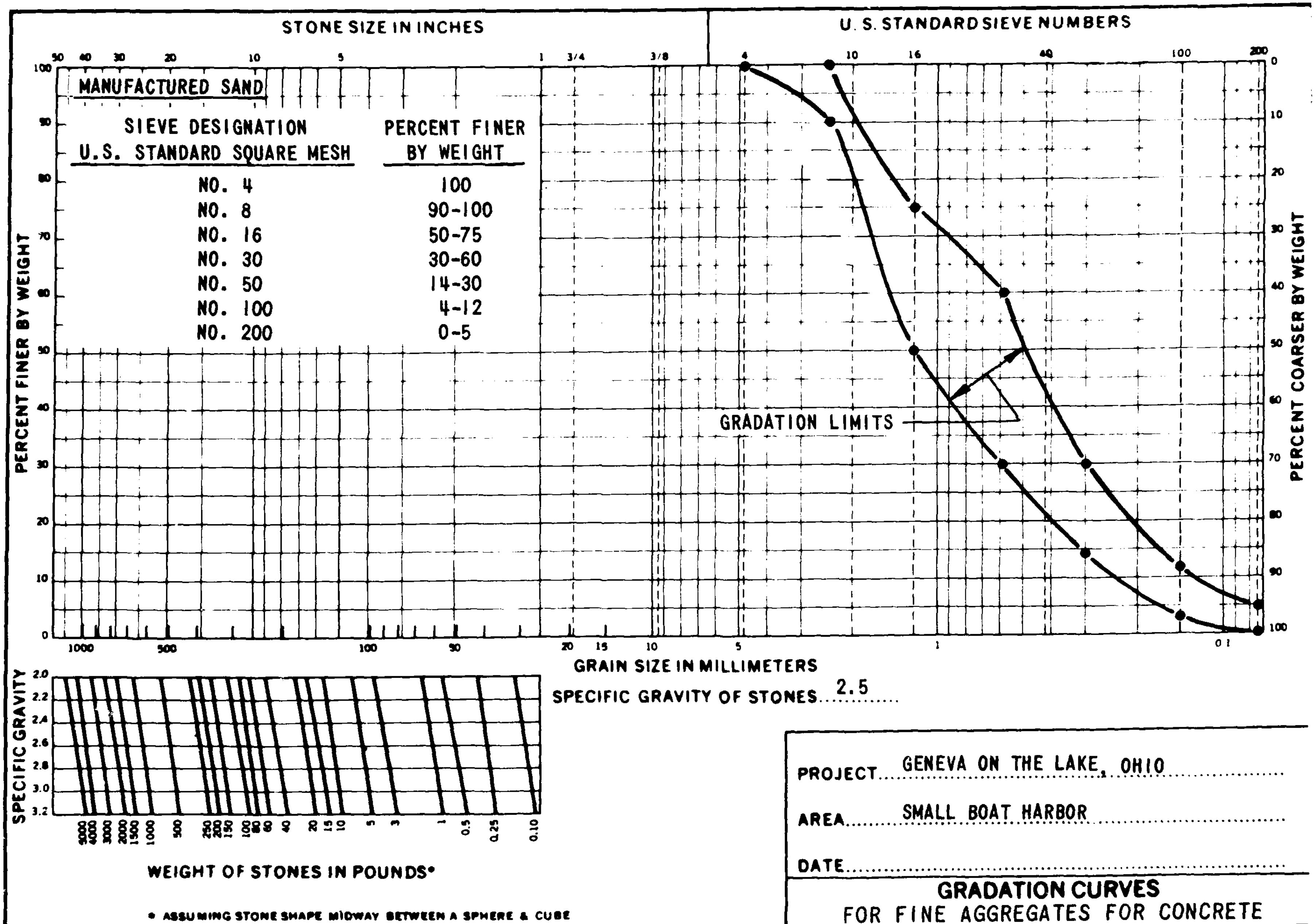
DATE

GRADATION CURVES

FOR FINE AGGREGATES FOR CONCRETE

ENG FORM 4056
APR 67

FIGURE A4



MANUFACTURED SAND

SIEVE DESIGNATION U.S. STANDARD SQUARE MESH	PERCENT FINER BY WEIGHT
NO. 4	100
NO. 8	90-100
NO. 16	50-75
NO. 30	30-60
NO. 50	14-30
NO. 100	4-12
NO. 200	0-5

SPECIFIC GRAVITY OF STONES 2.5

PROJECT GENEVA ON THE LAKE, OHIO

AREA SMALL BOAT HARBOR

DATE

GRADATION CURVES
FOR FINE AGGREGATES FOR CONCRETE

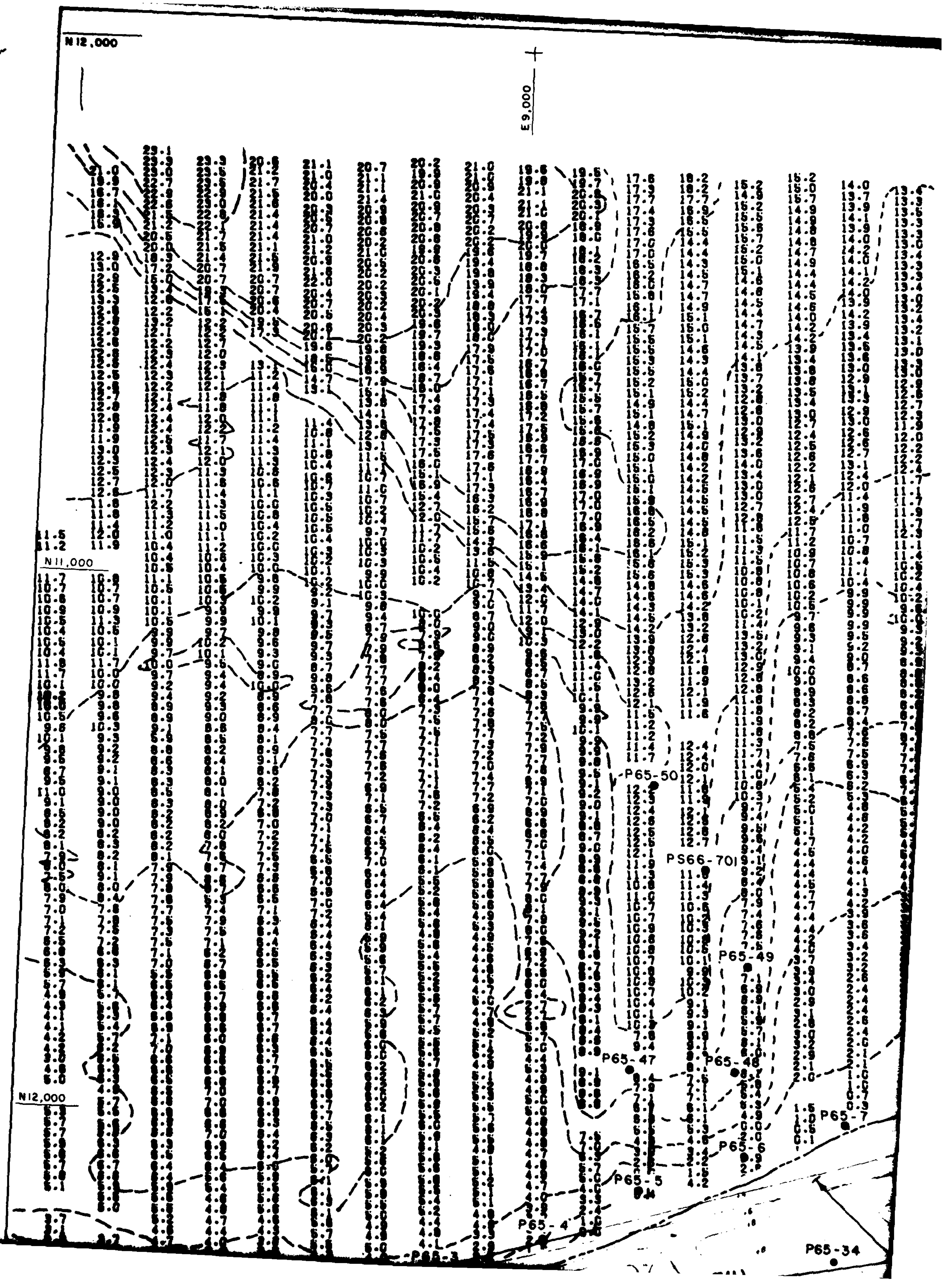
ENG FORM 4056
APR 57

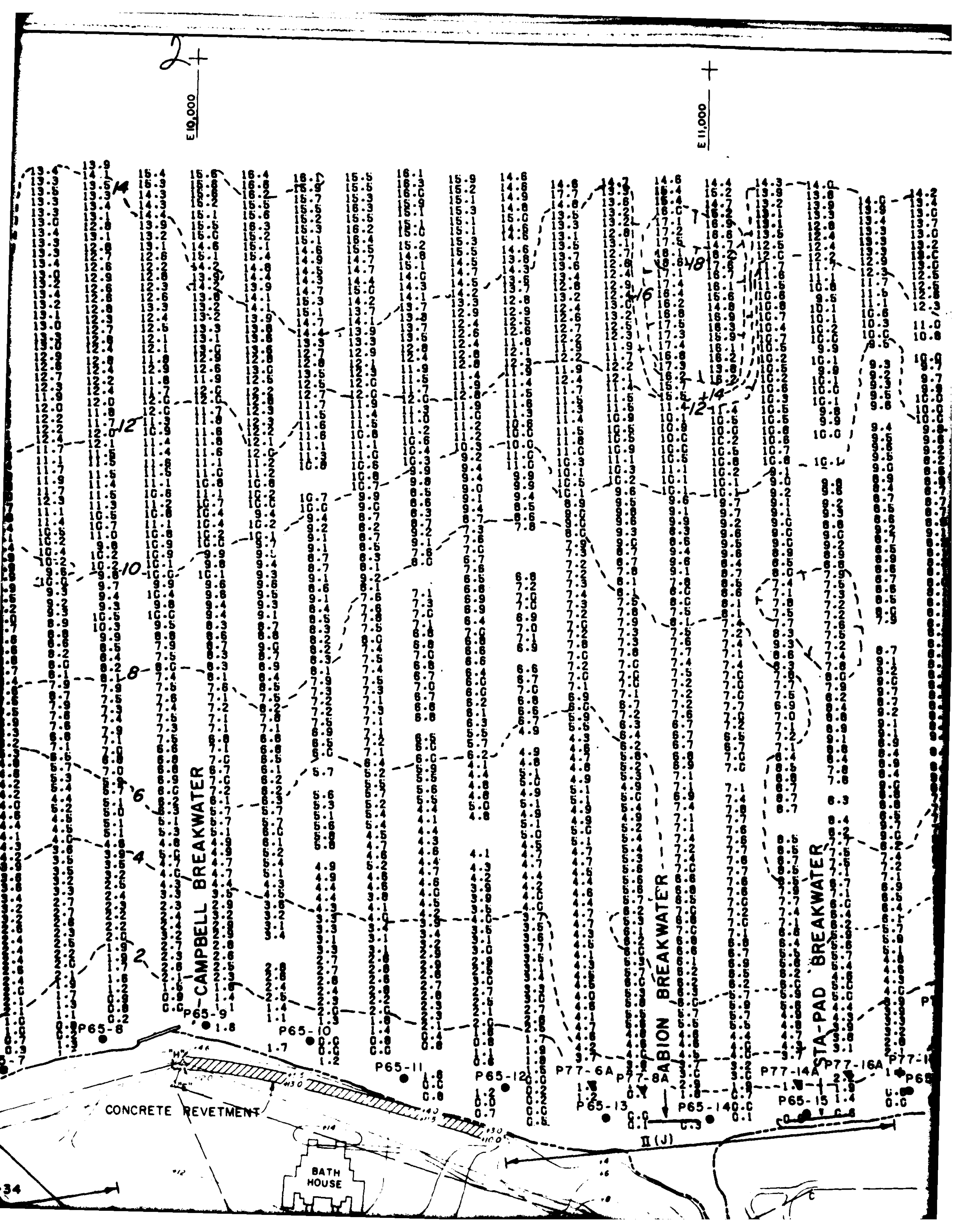
FIGURE A5

AD-A104 866 CORPS OF ENGINEERS BUFFALO NY BUFFALO DISTRICT F/G 13/2
GENEVA-ON-THE-LAKE, OHIO. SMALL-BOAT HARBOR. FINAL REFORMULATIO--ETC(U)
AUG 81

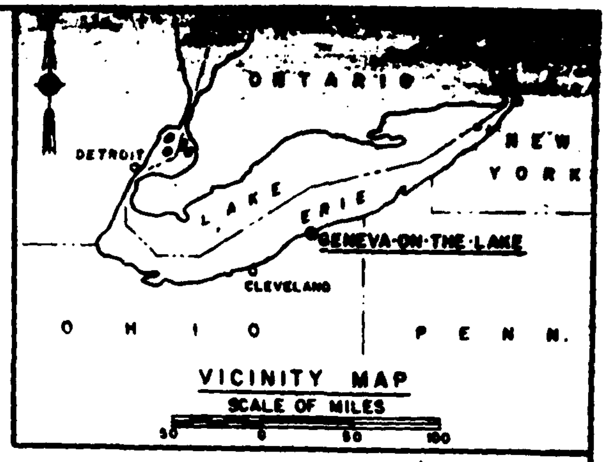
UNCLASSIFIED NL

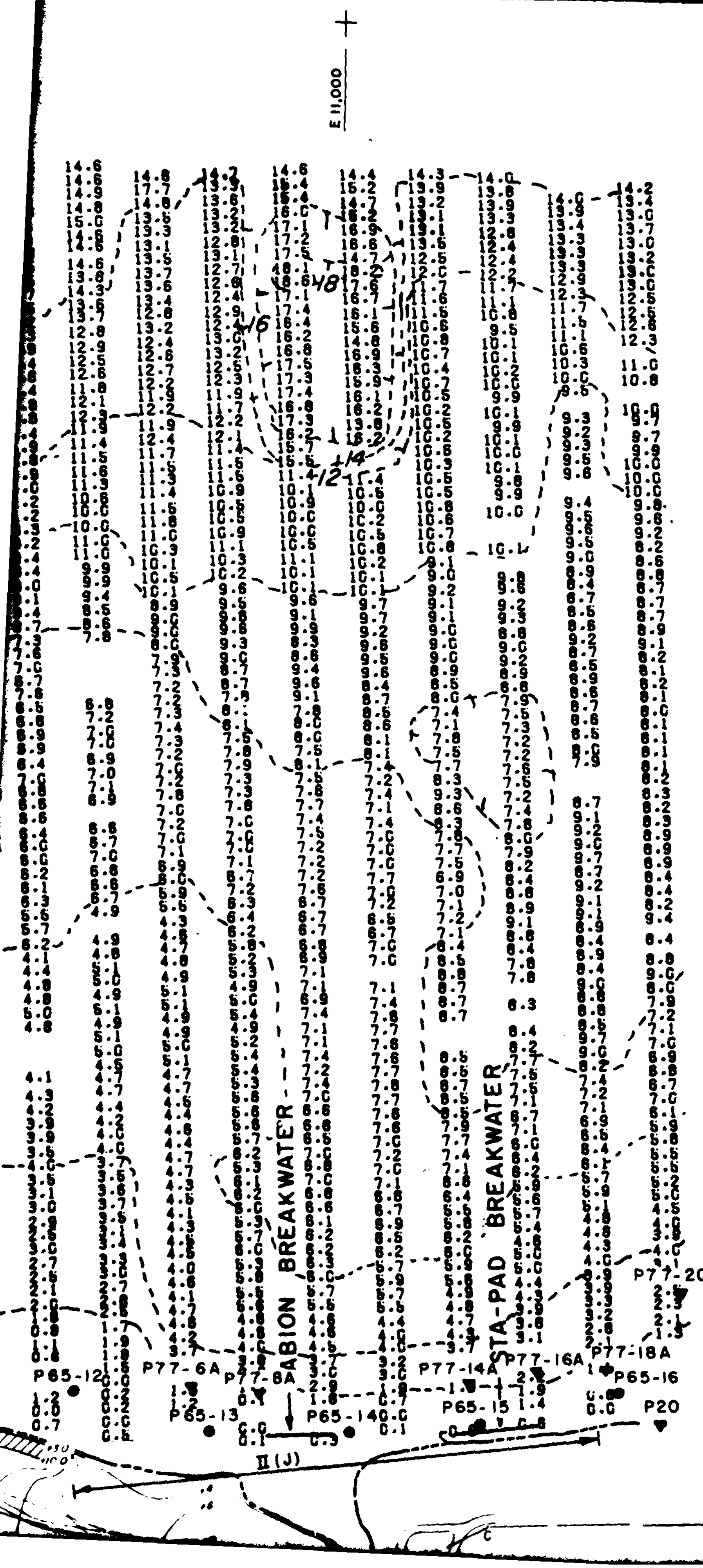
3 of 8
AD
A104866


N12,000
E9,000
N11,000
N12,000
P65-50
PS66-701
P65-49
P65-47
P65-48
P65-7
P65-6
P65-5
P65-4
P65-3
P65-34


2+
E10,000
E11,000
CAMPBELL BREAKWATER
ABION BREAKWATER
STA-PAD BREAKWATER
CONCRETE REVETMENT
BATH HOUSE
P65-8
P65-9
P65-10
P65-11
P65-12
P65-13
P65-14
P65-15
P77-6A
P77-8A
P77-14A
P77-16A
II (J)
34

3



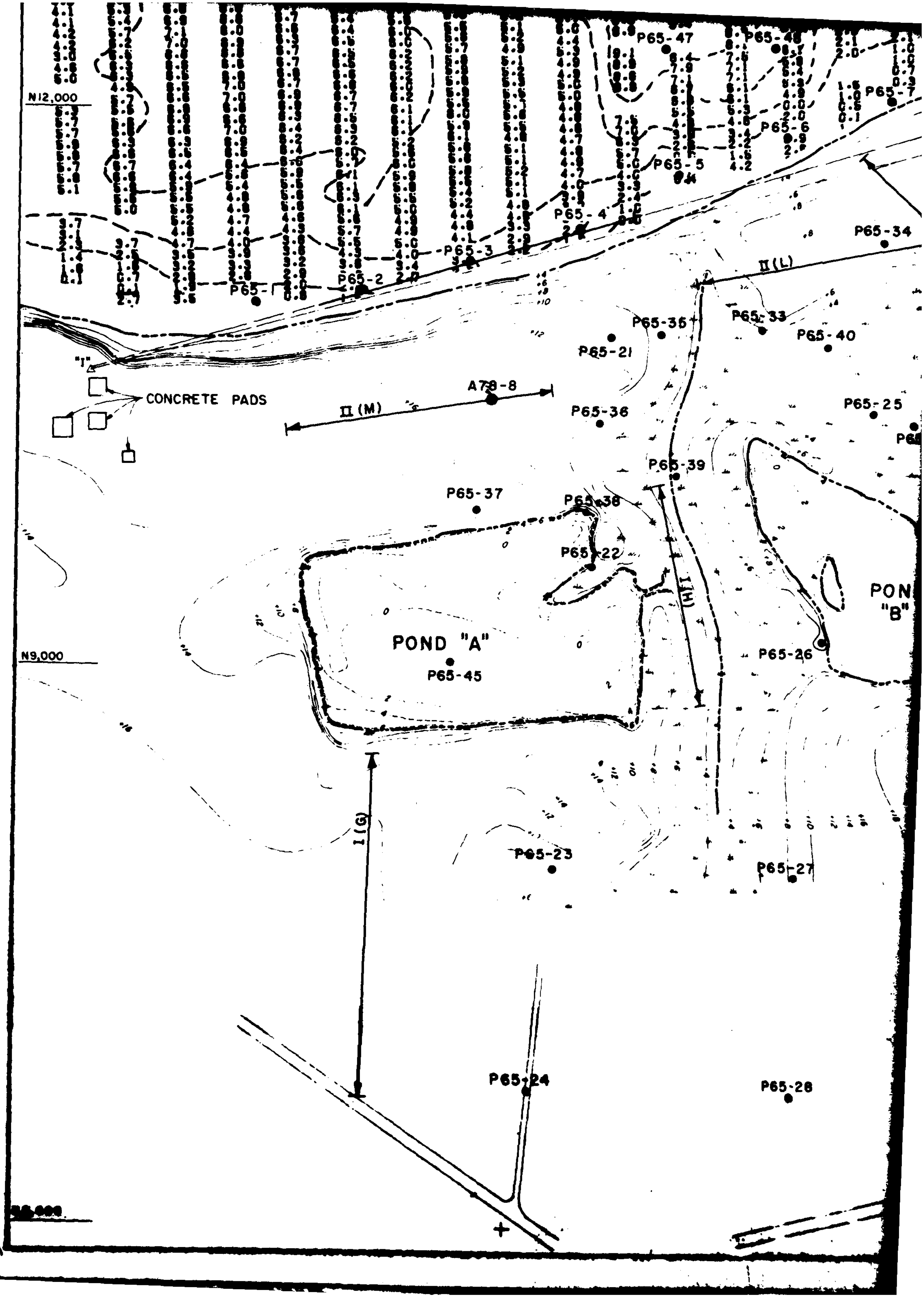


LEGEND

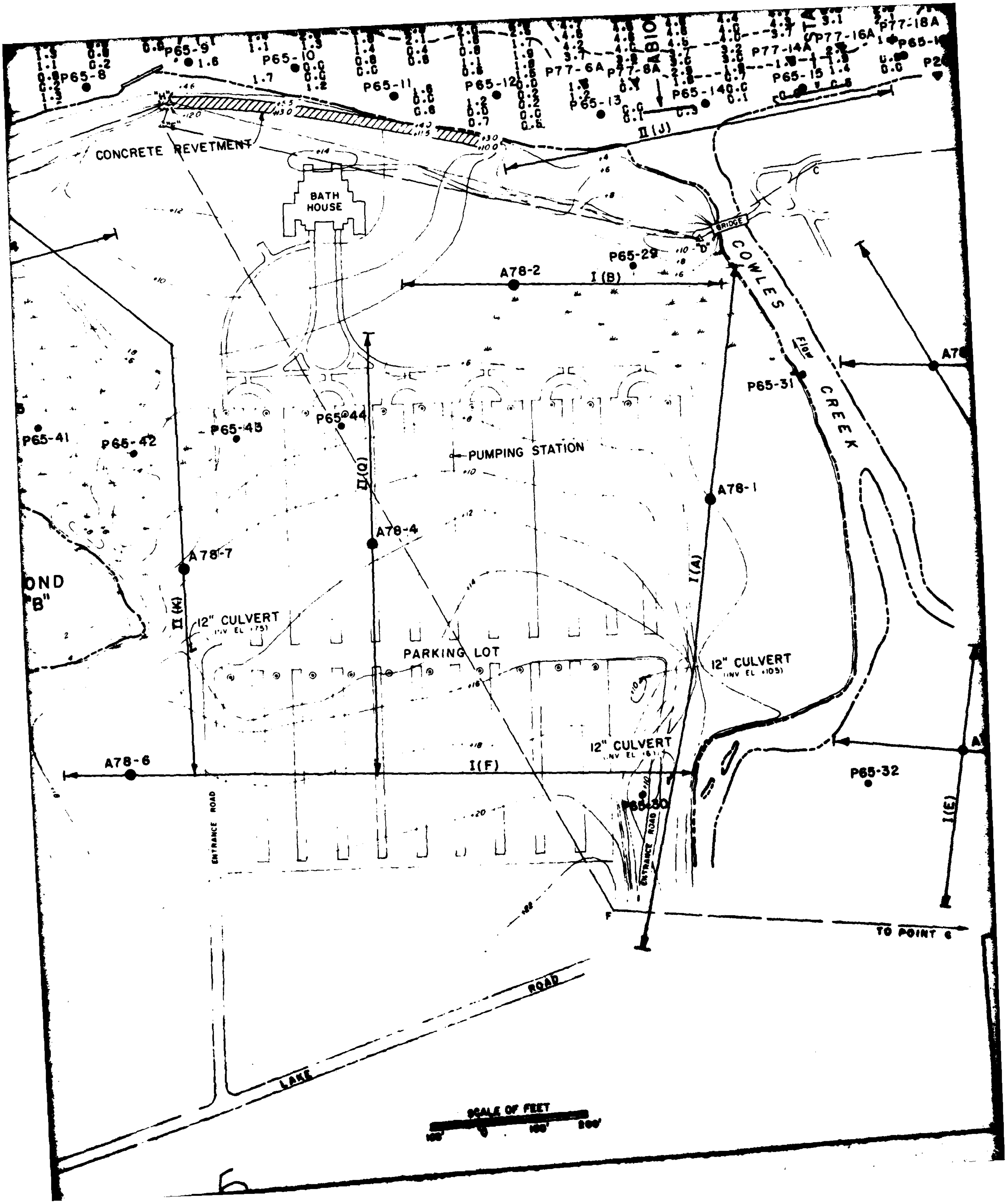
P65-30 ●	1965 PROBES
A78-7 ●	1978 AUGER BORINGS
▼	1977 PROBES
I (C)	GEOPHYSICAL SURVEY PATH, PHASE I
II (Q)	GEOPHYSICAL SURVEY PATH, PHASE II
PS66-701	1966 PORTER SAMPLER BORINGS
7.1	OFF SHORE SOUNDINGS (SUMMER 1979) WITH INTERPRETED SUBSURFACE CONTOURS
——+8——	SURFACE CONTOURS (FALL 1979)

NOTES:

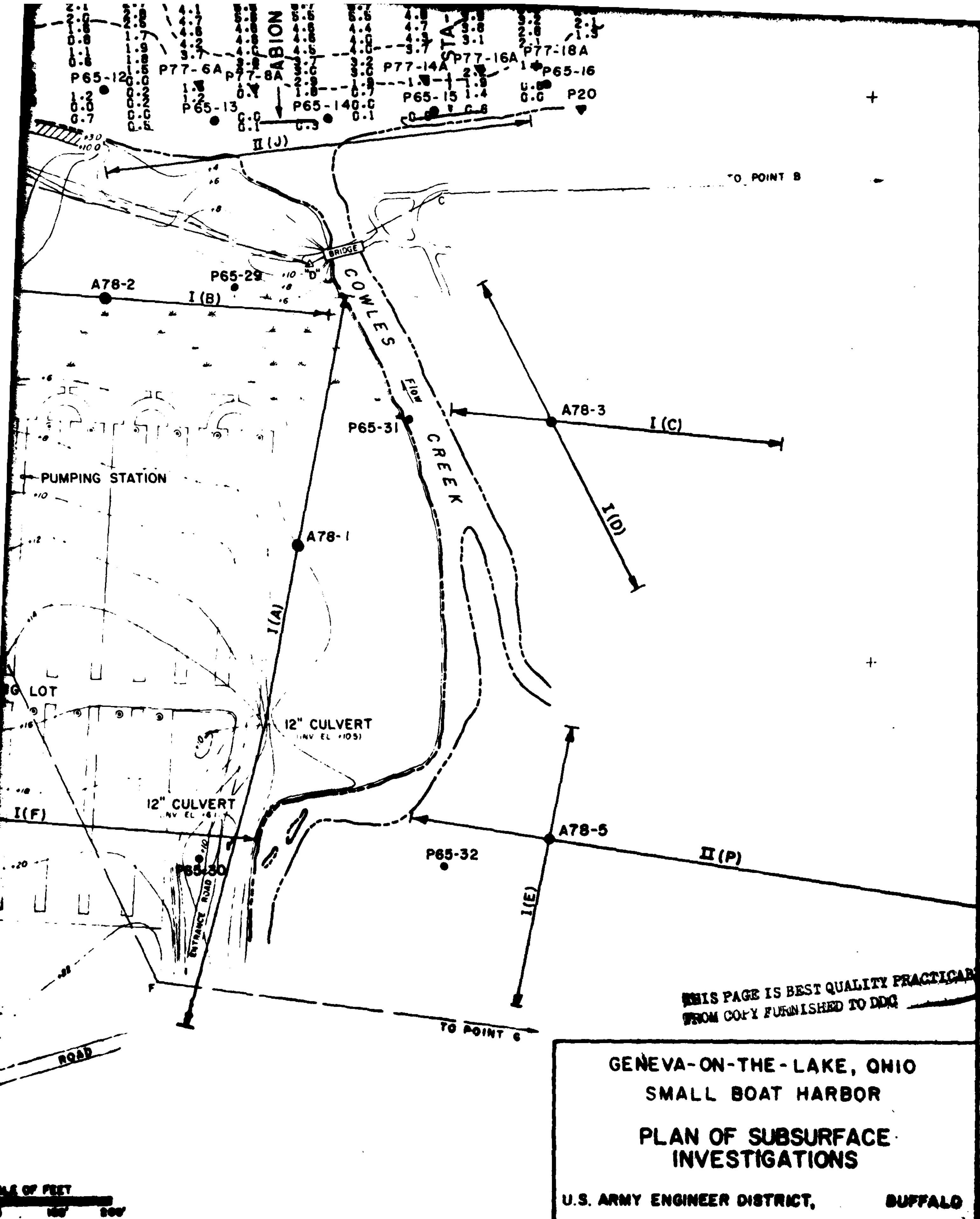
1. FOR LOCATIONS OF GEOLOGIC SECTIONS, SEE PLATE A4.
2. FOR GEOLOGIC SECTIONS, SEE PLATE A5.
3. FOR TOP OF GLACIAL TILL CONTOUR MAP, SEE PLATE A2.
4. FOR TOP OF ROCK CONTOUR MAP, SEE PLATE A3.


N12,000
N9,000
P65-47
P65-48
P65-7
P65-6
P65-5
P65-4
P65-3
P65-2
P65-1
P65-34
II(L)
P65-33
P65-35
P65-40
P65-21
"I"
CONCRETE PADS
A78-8
II(M)
P65-36
P65-25
P65-39
P65-37
P65-38
P65-22
I(H)
POND "A"
P65-45
"B"
P65-26
I(G)
P65-23
P65-27
P65-24
P65-28

4



P65-8
P65-9
P65-10
P65-11
P65-12
P65-13
P65-15
P77-6A
P77-8A
P77-14A
P77-16A
P77-18A
II (J)
CONCRETE REVETMENT
BATH HOUSE
BRIDGE
COWLES CREEK
FLOW
P65-29
A78-2
I (B)
P65-31
P65-41
P65-42
P65-43
P65-44
PUMPING STATION
II (Q)
A78-1
A78-4
A78-7
OND "B"
II (K)
12" CULVERT
PARKING LOT
12" CULVERT
I (A)
12" CULVERT
A78-6
I (F)
P65-30
P65-32
I (E)
ENTRANCE ROAD
ENTRANCE ROAD
TO POINT G
LAKE ROAD
SCALE OF FEET



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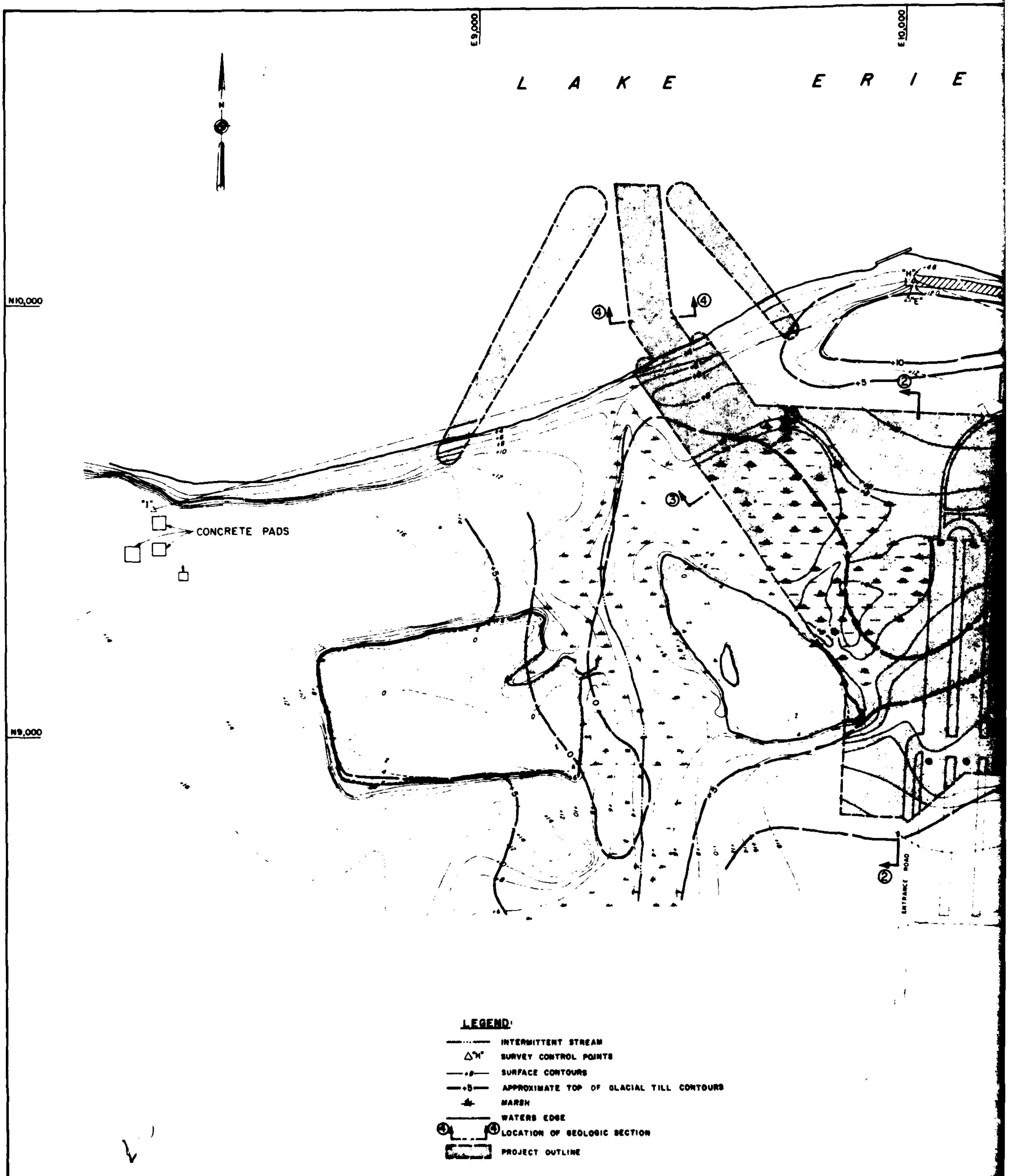
GENEVA-ON-THE-LAKE, OHIO
SMALL BOAT HARBOR

PLAN OF SUBSURFACE INVESTIGATIONS

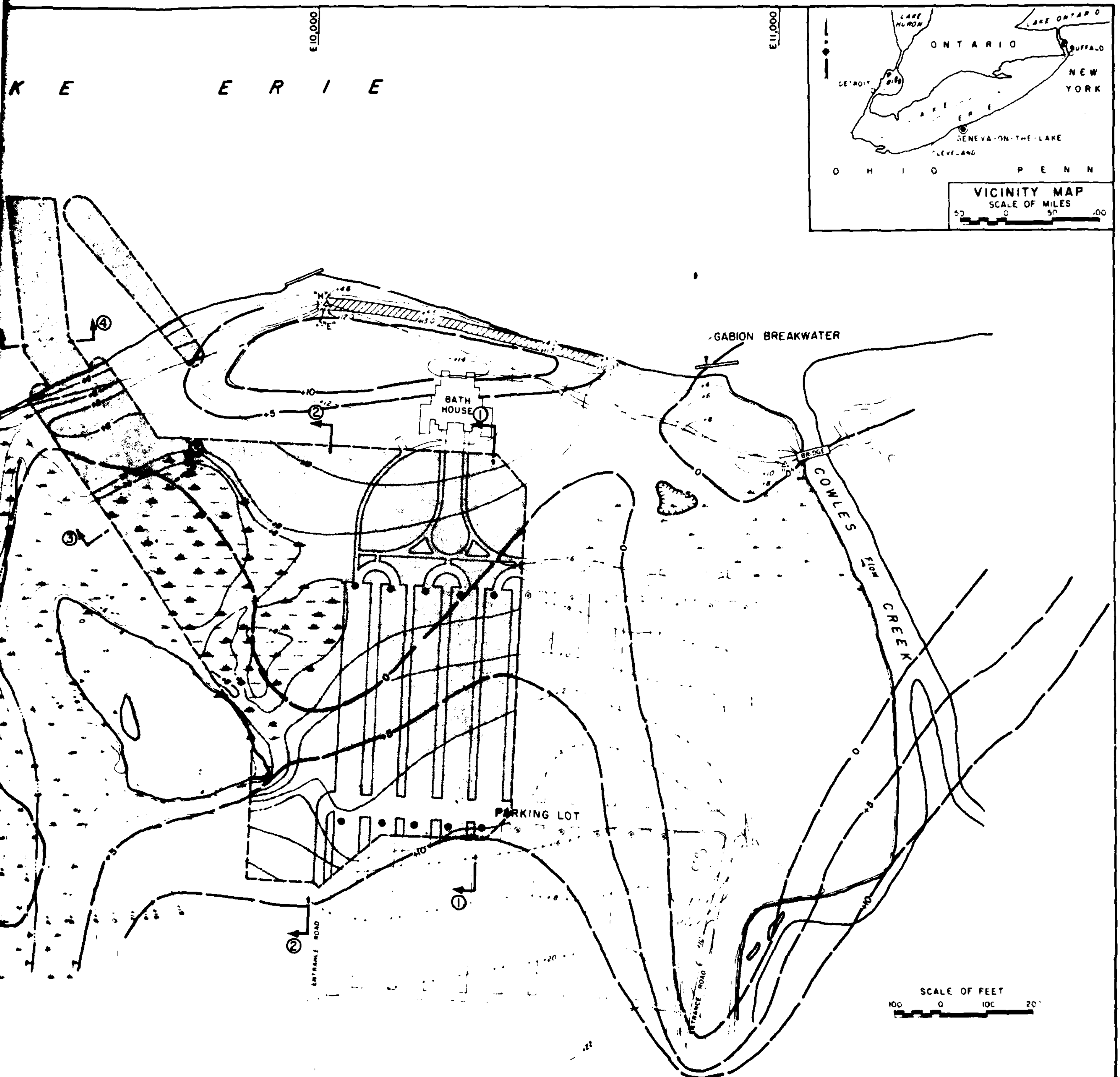
U.S. ARMY ENGINEER DISTRICT, BUFFALO

OCTOBER 1960

PLATE A1



E 9,000
E 10,000
L A K E E R I E
N
N10,000
N9,000
CONCRETE PADS
ENTRANCE ROAD
LEGEND:
INTERMITTENT STREAM
SURVEY CONTROL POINTS
SURFACE CONTOURS
APPROXIMATE TOP OF GLACIAL TILL CONTOURS
MARSH
WATERS EDGE
LOCATION OF GEOLOGIC SECTION
PROJECT OUTLINE



GLACIAL TILL CONTOURS

SECTION

NOTES:

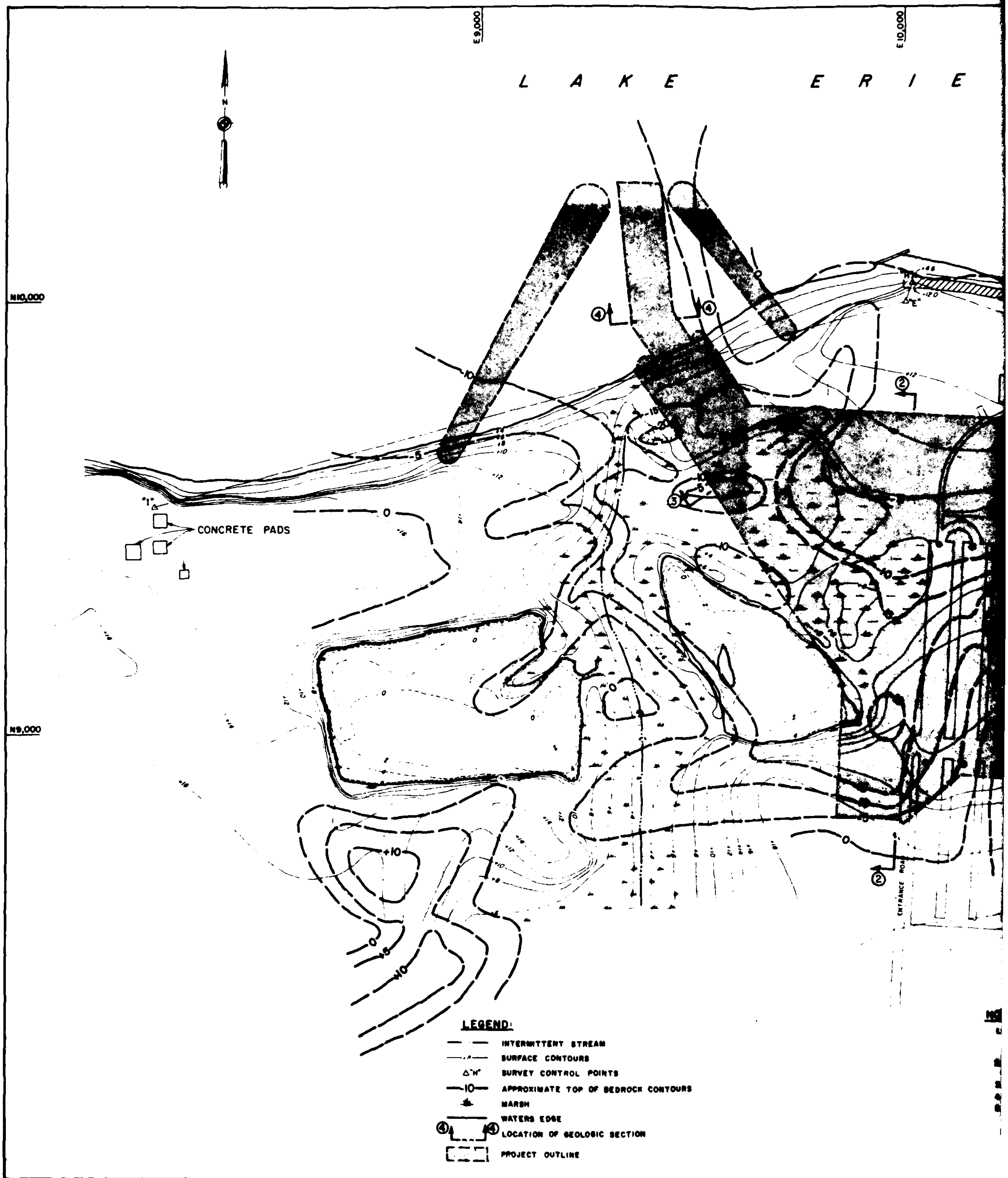
1. ALL ELEVATIONS ARE CORRECTED AND REFERRED TO LOW WATER DATUM (L.W.D.), ELEVATION 568.6 FEET ABOVE MEAN WATER LEVEL AT FATHER POINT, QUEBEC (IGLD 1955).
2. TOP OF GLACIAL TILL CONTOURS WERE DERIVED FROM A GEOPHYSICAL SURVEY AND FROM LIMITED EXPLORATIONS.
3. FOR TOP OF ROCK CONTOUR MAP, SEE PLATE A3.
4. FOR LOCATIONS OF GEOLOGIC SECTIONS, SEE PLATE A4.
5. FOR GEOLOGIC SECTIONS, SEE PLATE A5.

GENEVA-ON-THE-LAKE, OHIO
SMALL BOAT HARBOR

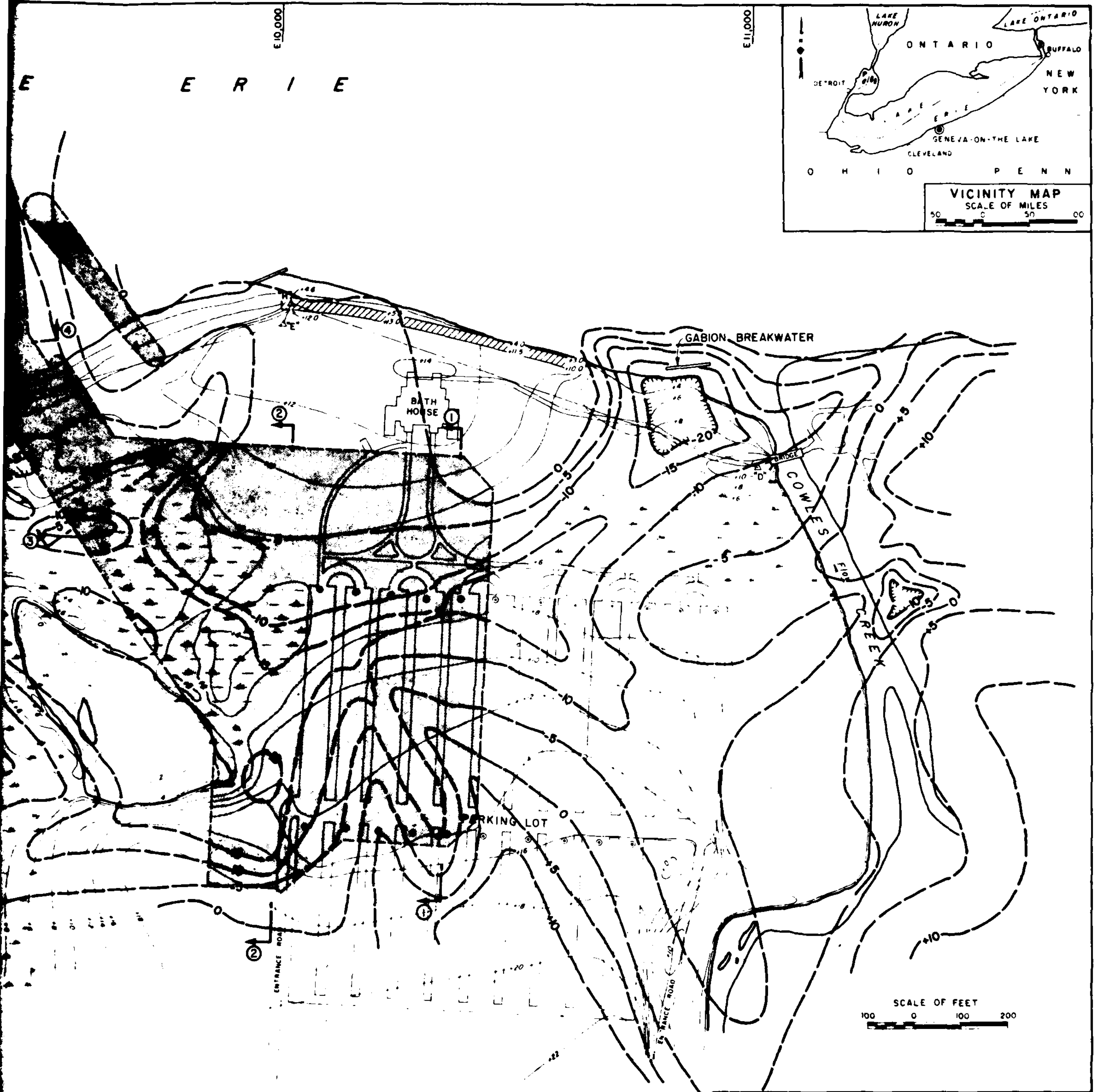
TOP OF GLACIAL TILL
CONTOUR MAP

U.S. ARMY ENGINEER DISTRICT BUFFALO
OCTOBER 1980

PLATE A2



E 9,000
E 10,000
N
LAKE ERIE
N10,000
N9,000
"I"
CONCRETE PADS
ENTRANCE ROAD
LEGEND:
INTERMITTENT STREAM
SURFACE CONTOURS
SURVEY CONTROL POINTS
APPROXIMATE TOP OF BEDROCK CONTOURS
MARSH
WATERS EDGE
LOCATION OF GEOLOGIC SECTION
PROJECT OUTLINE



NOTES:

1. ALL ELEVATIONS ARE CORRECTED AND REFERRED TO LOW WATER DATUM (L.W.D.), ELEVATION 568.6 FEET ABOVE MEAN WATER LEVEL AT FATHER POINT, QUEBEC (IGLD 1955).
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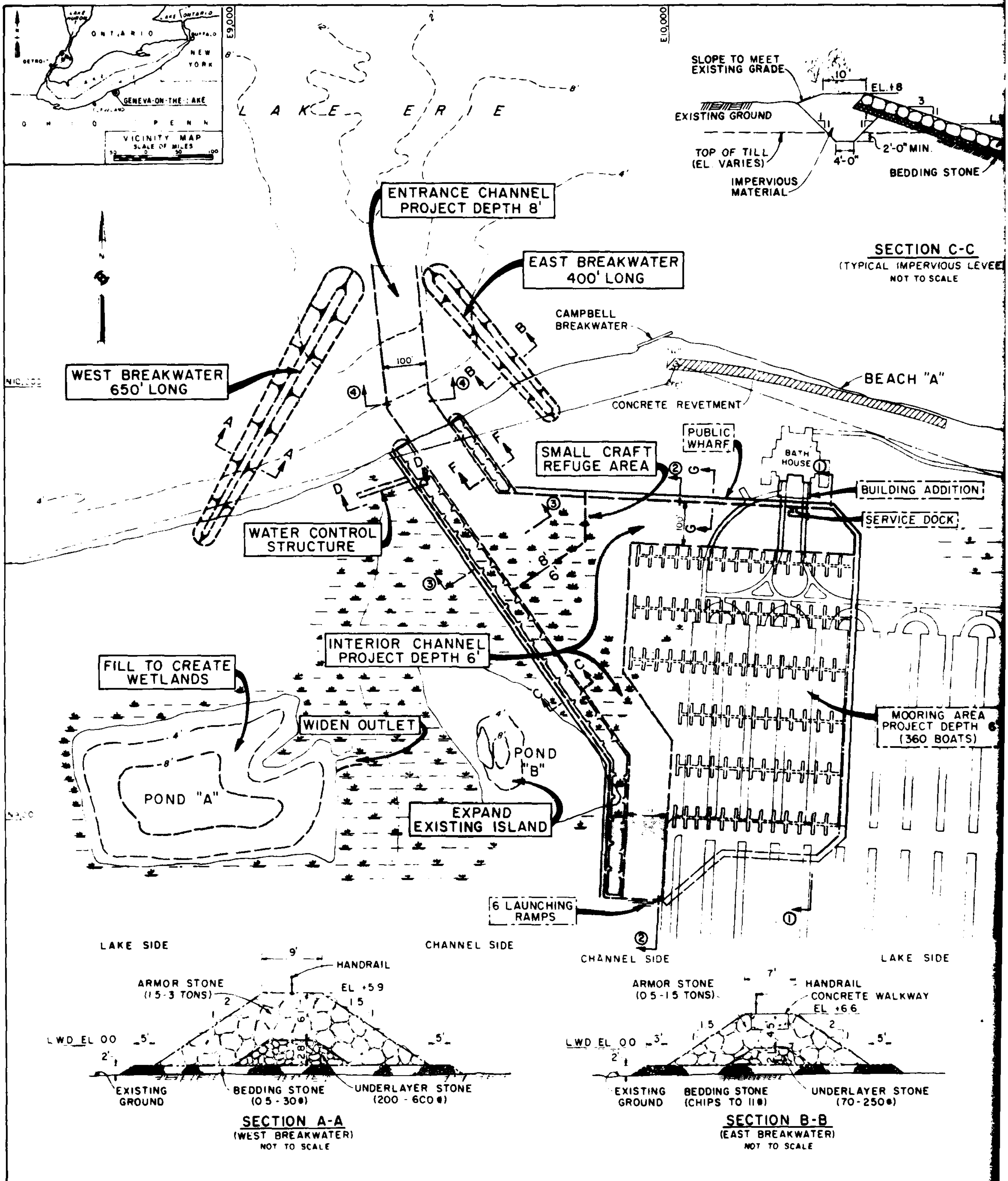
GENEVA-ON-THE-LAKE, OHIO
SMALL BOAT HARBOR

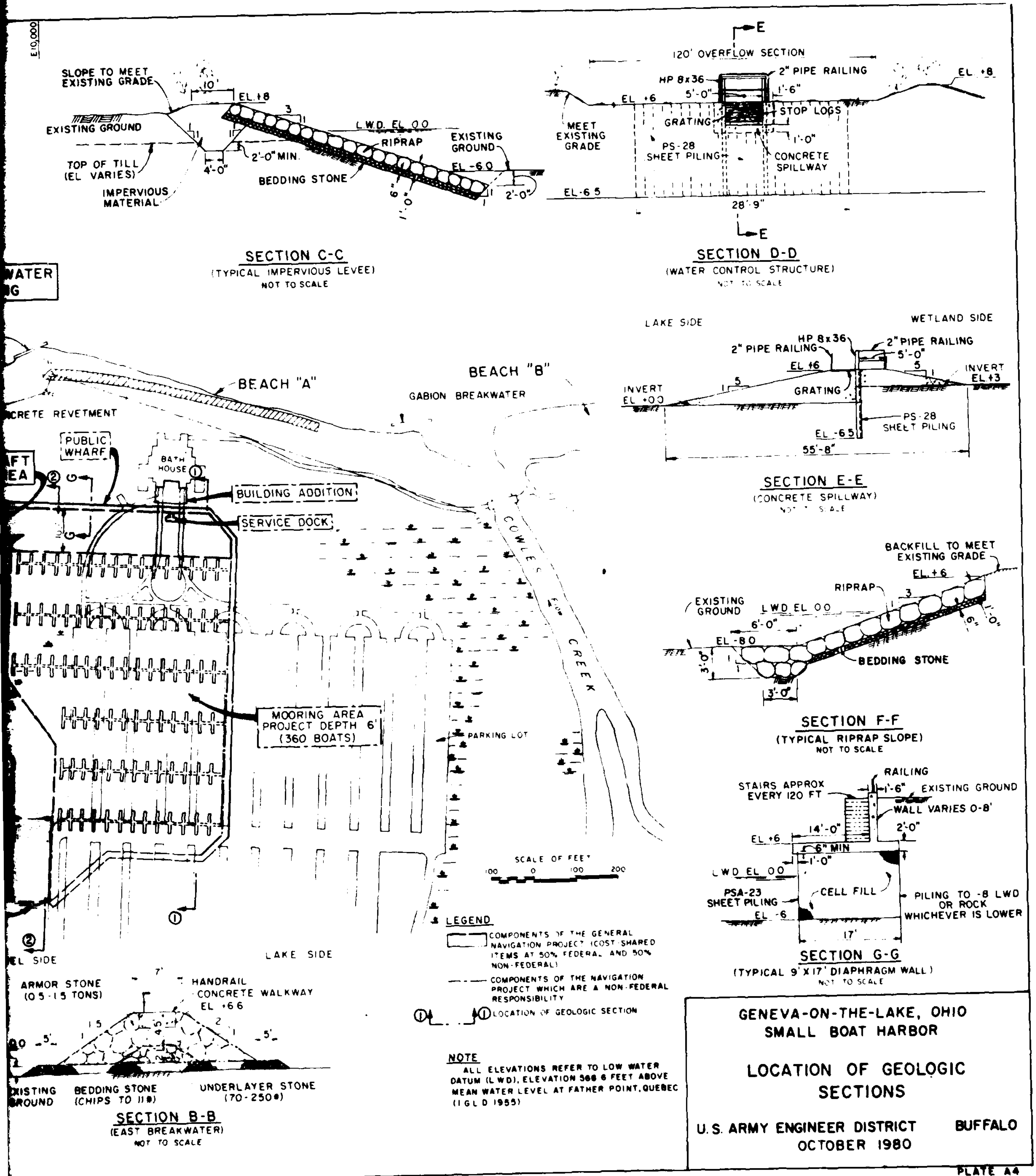
TOP OF ROCK
CONTOUR MAP

U.S. ARMY ENGINEER DISTRICT BUFFALO
OCTOBER 1980

2



VICINITY MAP
SCALE OF MILES
LAKE HURON
LAKE ONTARIO
ONTARIO
BUFFALO
NEW YORK
DETROIT
GENEVA-ON-THE-LAKE
OHIO
PENN
LAKE ERIE
ENTRANCE CHANNEL PROJECT DEPTH 8'
EAST BREAKWATER 400' LONG
WEST BREAKWATER 650' LONG
CAMPBELL BREAKWATER
BEACH "A"
CONCRETE REVETMENT
PUBLIC WHARF
BATH HOUSE
SMALL CRAFT REFUGE AREA
BUILDING ADDITION
SERVICE DOCK
WATER CONTROL STRUCTURE
INTERIOR CHANNEL PROJECT DEPTH 6'
FILL TO CREATE WETLANDS
WIDEN OUTLET
POND "A"
POND "B"
EXPAND EXISTING ISLAND
MOORING AREA PROJECT DEPTH 6' (360 BOATS)
6 LAUNCHING RAMPS
SLOPE TO MEET EXISTING GRADE
EL. +8
EXISTING GROUND
TOP OF TILL (EL. VARIES)
IMPERVIOUS MATERIAL
2'-0" MIN.
4'-0"
BEDDING STONE
SECTION C-C
(TYPICAL IMPERVIOUS LEVEE)
NOT TO SCALE
LAKE SIDE
CHANNEL SIDE
HANDRAIL
ARMOR STONE (1.5-3 TONS)
EL +5.9
LWD EL 0.0
EXISTING GROUND
BEDDING STONE (0.5-30#)
UNDERLAYER STONE (200-600#)
SECTION A-A
(WEST BREAKWATER)
NOT TO SCALE
CHANNEL SIDE
LAKE SIDE
ARMOR STONE (0.5-1.5 TONS)
HANDRAIL
CONCRETE WALKWAY
EL +6.6
LWD EL 0.0
EXISTING GROUND
BEDDING STONE (CHIPS TO 11#)
UNDERLAYER STONE (70-250#)
SECTION B-B
(EAST BREAKWATER)
NOT TO SCALE

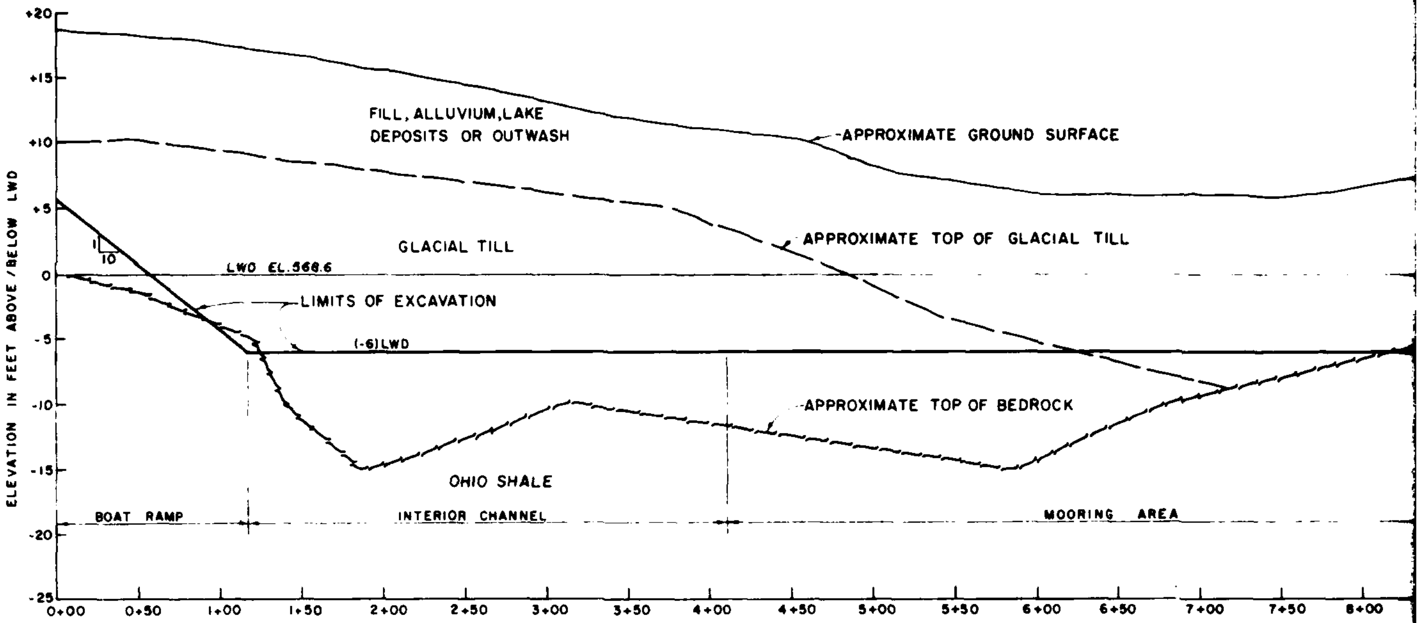


GENEVA-ON-THE-LAKE, OHIO
SMALL BOAT HARBOR

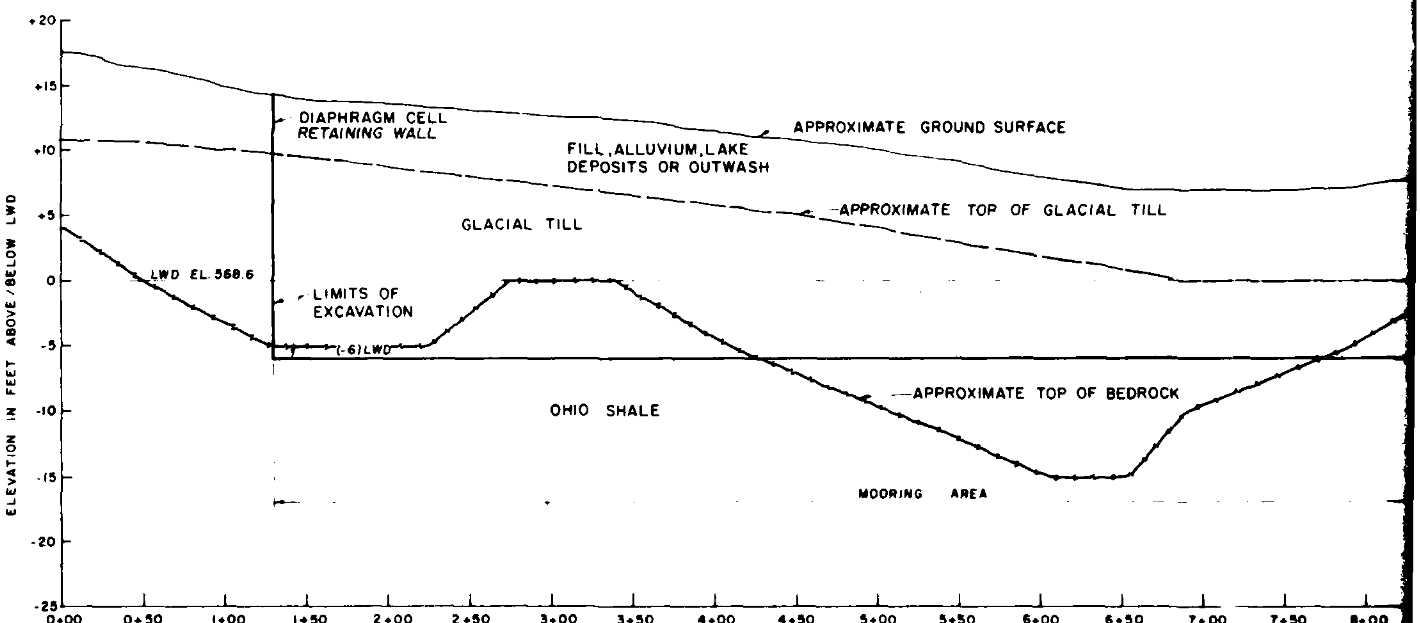
LOCATION OF GEOLOGIC SECTIONS

U.S. ARMY ENGINEER DISTRICT BUFFALO
OCTOBER 1980

PLATE A4

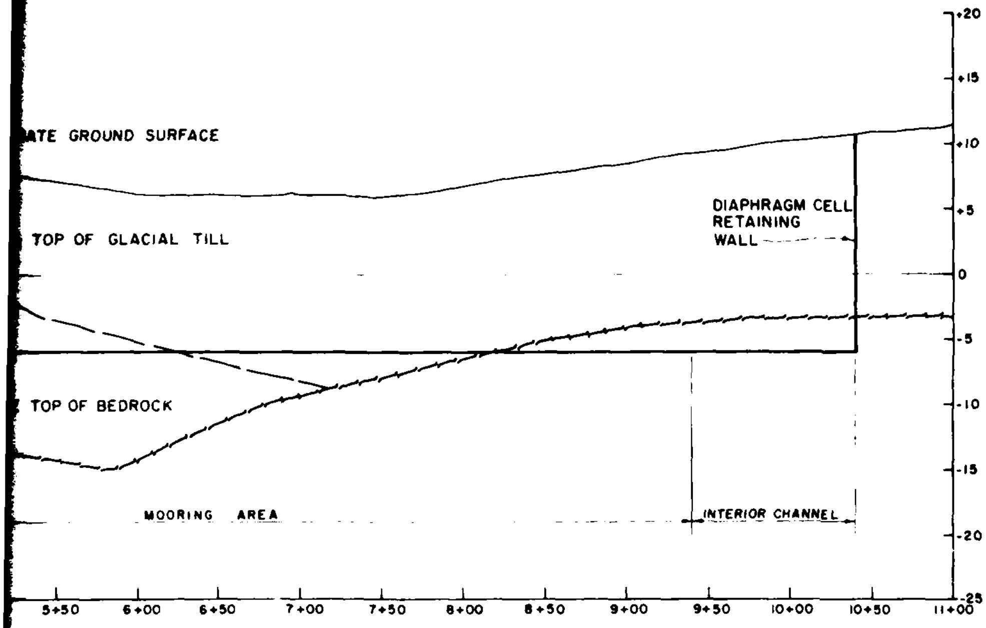


GEOLOGIC SECTION ② STA. 10+57E

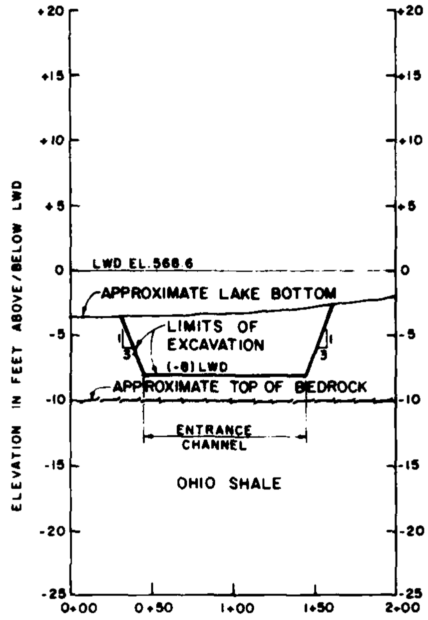


GEOLOGIC SECTION ① STA. 14+07E

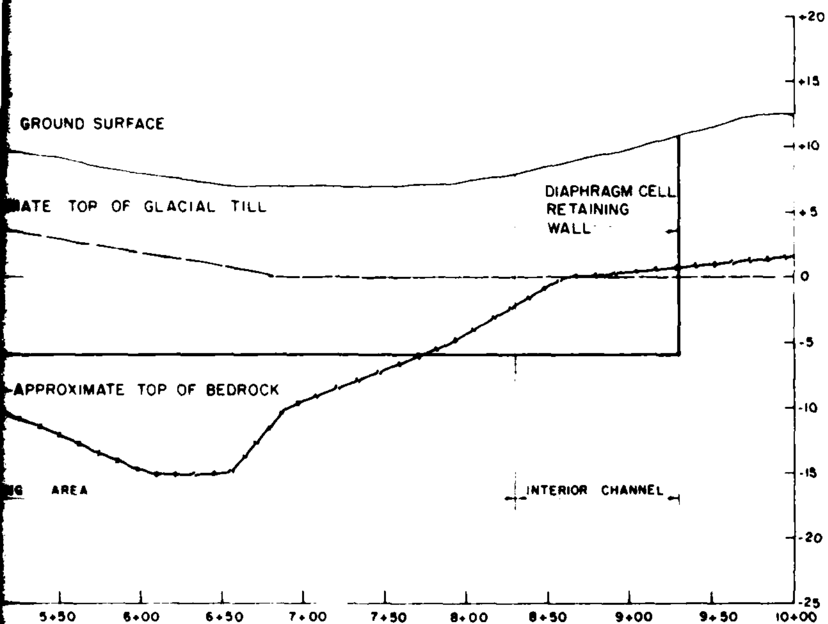
DATA INTERPRETATION GEOLOGIC CLASSIFICATION BASED ON VELOCITIES FROM SEISMIC SURVEY	
VELOCITY RANGE (FEET PER SECOND)	GEOLOGIC MATERIAL
1,050 - 2,500	FILL, ALLUVIUM, LAKE DEPOSITS OR OUTWASH
5,600 - 6,900	GLACIAL TILL
7,000	BEDROCK



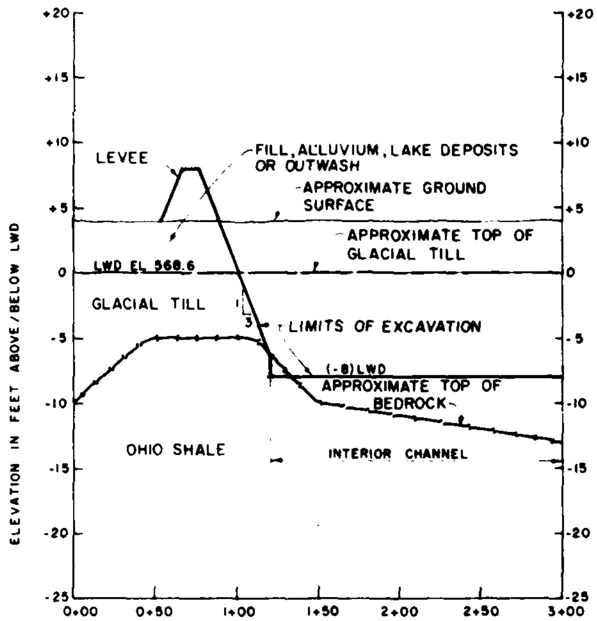
GIC SECTION ② STA. 10+57E



GEOLOGIC SECTION ④ STA. 2+69S



GIC SECTION ① STA. 14+07E



GEOLOGIC SECTION ③ STA. 6+69S

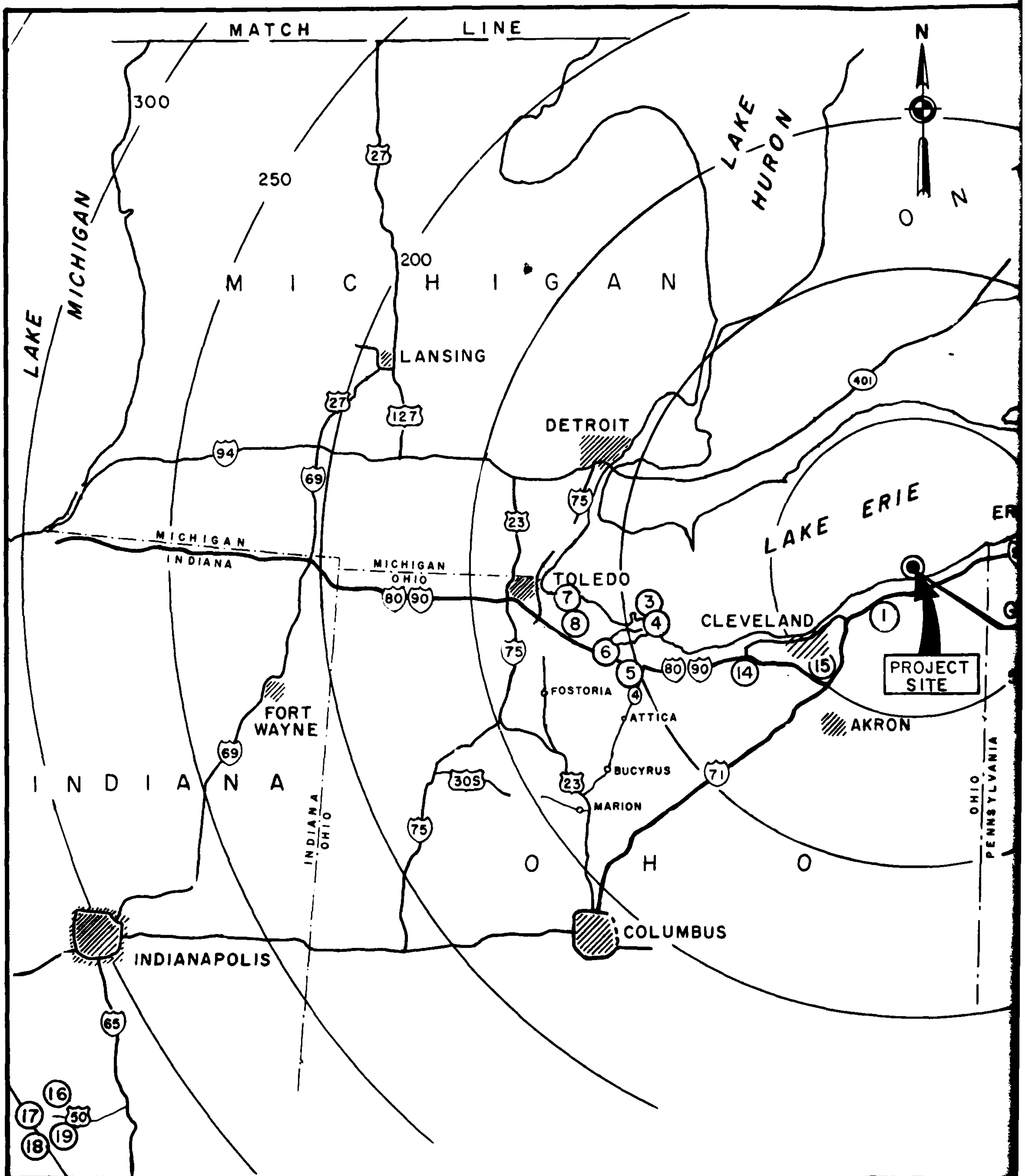
NOTE:

1. ALL ELEVATIONS ARE REFERRED TO LOW WATER DATUM (LWD) ELEVATION 568.6 FEET ABOVE MEAN WATER LEVEL AT FATHER POINT QUEBEC (IGLD 1955)
2. FOR LOCATIONS OF GEOLOGIC SECTIONS, SEE PLATE A4
3. FOR TOP OF GLACIAL TILL CONTOUR MAP, SEE PLATE A2
4. FOR TOP OF ROCK CONTOUR MAP, SEE PLATE A3.

GENEVA-ON-THE LAKE, OHIO
SMALL BOAT HARBOR

GEOLOGIC SECTIONS

U S ARMY ENGINEER DISTRICT, BUFFALO
OCTOBER 1980



MATCH LINE
300
250
200
LAKE MICHIGAN
LAKE HURON
MICHIGAN
LANSING
DETROIT
LAKE ERIE
TOLEDO
CLEVELAND
PROJECT SITE
AKRON
FORT WAYNE
INDIANA
OHIO
FOSTORIA
ATTICA
BUCYRUS
MARION
COLUMBUS
INDIANAPOLIS
MICHIGAN INDIANA
MICHIGAN OHIO
INDIANA OHIO
OHIO PENNSYLVANIA
ON
27
127
94
69
23
75
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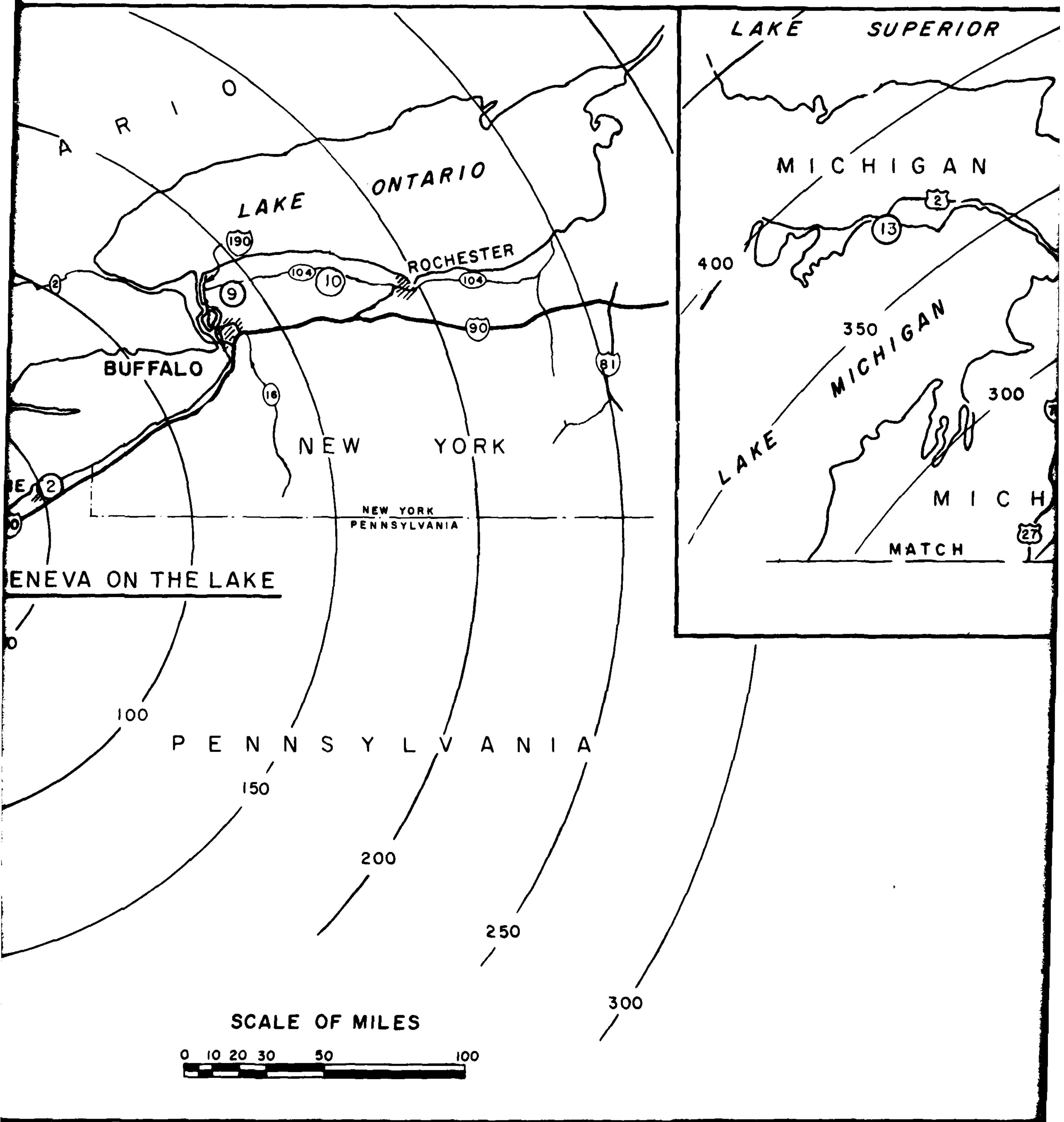

A R I O
LAKE ONTARIO
ROCHESTER
BUFFALO
NEW YORK
NEW YORK
PENNSYLVANIA
ENEVA ON THE LAKE
100
PENNSYLVANIA
150
200
250
300
SCALE OF MILES
0 10 20 30 50 100
LAKE SUPERIOR
MICHIGAN
400
350
LAKE MICHIGAN
300
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MATCH
190
104
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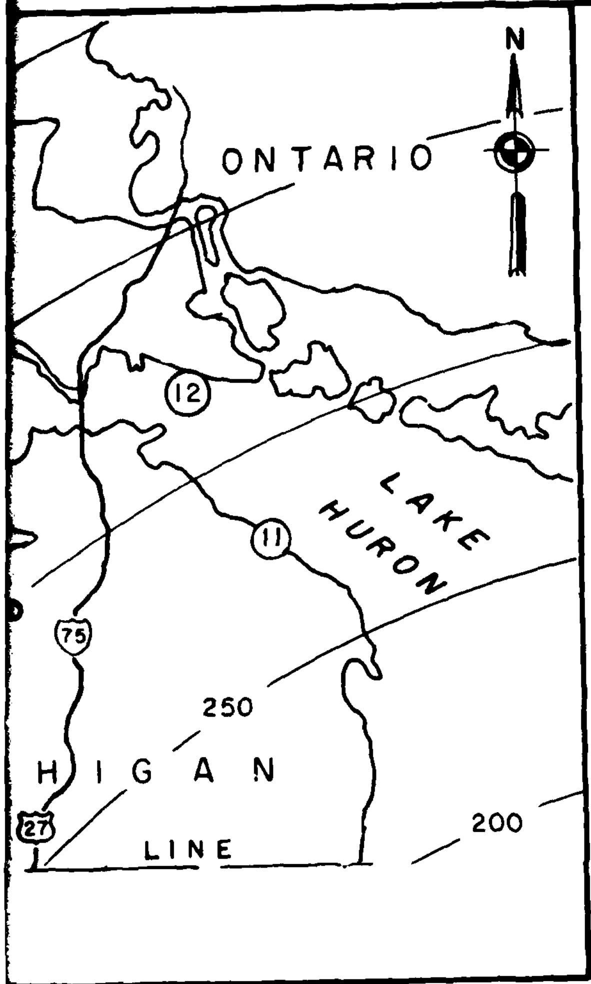
90
16
81
13
27



NOTES:

1. NUMBER IN CIRCLE INDICATES QUARRY SITE.
2. FOR QUARRY NAMES AND PRODUCTS SEE MAP SUPPLEMENT SHEET.

GENEVA ON THE LAKE, OHIO

LOCATION MAP
POSSIBLE MATERIAL SOURCES

U.S. ARMY ENGINEER DISTRICT, BUFFALO
TO ACCOMPANY GDM, PHASE I, STAGE III

PLATE A

3

MAP SUPPLEMENT SHEET SUMMARY OF POSSIBLE SOURCES FOR CONSTRUCTION MATERIALS													
SITE NUMBER	SOURCE	QUARRY OR PIT LOCATION	[illegible]	ARMOR STONE	UNDERLAYER STONE	BEDDING STONE	BEDDING/FILTER STONE	12-INCH RIPRAP	COARSE AGGREGATE	FINE AGGREGATE			
1.	R.W. SIDLEY, INC.	THOMPSON, OH	12 MI.							X			
2.	ERIE SAND AND GRAVEL, INC.	ERIE, PA	60 MI.						X	X			
3.	QUALITY QUARRIES	KELLEYS ISLAND, OH	93 MI.	X	X			X					
4.	STANDARD SLAG CO.	MARBLEHEAD, OH.	94 MI.	X	X	X	X	X	X				
5.	SANDUSKY CRUSHED STONE CO.	PARKERTOWN, OH	101 MI.			X	X	X					
6.	ERIE BLACKTOP, INC.	CASTALIA, OH	102 MI.				X	X					
7.	F. KRAEMER AND SON, INC.	CLAY CENTER, OH	125 MI.		X		X	X					
8.	WOODVILLE LIME & CHEMICAL CO.	WOODVILLE, OH	126 MI.		X		X	X	X				
9.	FRONTIER STONE PRODUCTS	LOCKPORT, N.Y.	150 MI.	X	X	X	X	X	X				
10.	MEDINA SANDSTONE CO.	HULBERTON, N.Y.	180 MI.	X	X								
11.	U.S. STEEL CORP.	ROGERS CITY, MI.	290 MI.			X							
12.	U.S. STEEL CORP.	CEDARVILLE, MI	330 MI.			X							
13.	INLAND LIME AND STONE CO.	GULLIVER, MI.	380 MI.			X							
14.	CLEVELAND QUARRIES	SOUTH AMHERST, OH	65 MI.	X	X	X	X	X					
15.	BOYAS EXCAVATING MATERIALS DIV	VALLEY VIEW, OH	45 MI.	X	X	X	X	X					
16.	B.G. HOADLEY QUARRIES	BLOOMINGTON, IN	345 MI.	X									
17.	INDIANA LIMESTONE CO.	BEDFORD, IN.	350 MI.	X									
18.	VICTOR OOLICTIC STONE CO.	BLOOMINGTON, IN	360 MI.	X									

14.	CLEVELAND QUARRIES	SOUTH AMHERST, OH	65 MI.	X	X	X	X	X
15.	BOYAS EXCAVATING MATERIALS DIV	VALLEY VIEW, OH	45 MI.	X	X	X	X	X
16.	B.G. HOADLEY QUARRIES	BLOOMINGTON, IN	345 MI.	X				
17.	INDIANA LIMESTONE CO.	BEDFORD, IN.	350 MI.	X				
18.	VICTOR OOLICTIC STONE CO.	BLOOMINGTON, IN	360 MI.	X				
19.	WOOLERY STONE CO.	BLOOMINGTON, IN	350 MI.	X				

GENEVA ON THE LAKE, OHIO

MATERIAL SURVEY SUMMARY OF SOURCES

U. S. ARMY ENGINEER DISTRICT, BUFFALO

TO ACCOMPANY GDM, PHASE I, STAGE III

ARMOR STONE

TYPE A1 6.5 - 15 TONS
TYPE A2 3-6.5 TONS
TYPE A3 1.5-3 TONS
TYPE A4 0.5-1.5 TONS

UNDERLAYER STONE

TYPE U1 .5-1.5 TONS
TYPE U2 400-1300 LBS.
TYPE U3 200-600 LBS.
TYPE U4 70-250 LBS.

BEDDING/FILTER

TYPE F NO. 200 SIEVE - 4 INCHES

12 INCH RIPRAP

TYPE R 3.5-81 POUNDS

COARSE AGGREGATES

TYPE CA NO. 8 SIEVE - 1 1/2 INCHES

FINE AGGREGATES

TYPE FA NO. 200 SIEVE - 3/8 INCH

BEDDING STONE

TYPE B1 2-150 POUNDS
TYPE B2 1-80 POUNDS
TYPE B3 0.5-60 POUNDS
TYPE B4 0.3-11 POUNDS

APPENDIX B

DESIGN AND COASTAL PROCESSES

GENEVA-ON-THE-LAKE SMALL-BOAT HARBOR

FINAL REFORMULATION PHASE I GENERAL DESIGN MEMORANDUM

U. S. Army Engineer District, Buffalo
1776 Niagara Street
Buffalo, NY 14207

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GENEVA-ON-THE-LAKE, OHIO

FINAL PHASE I REFORMULATION
GENERAL DESIGN MEMORANDUM

APPENDIX B
DESIGN AND COASTAL PROCESSES

Table of Contents

INTRODUCTION

B1. GENERAL

This appendix presents the coastal processes, the considerations for alternative development, the design criteria, and the detailed design including stone size computation and structure cross sections for the small-boat harbor-of-refuge at Geneva State Park, OH. Five alternative plans were developed and designed. All alternative plans include at least two rubble-mound breakwaters, an entrance channel, and an inner harbor enclosed mooring area. Sand bypassing is anticipated with each alternative to maintain the shoreline status quo.

B2. Alternative 2 includes an offshore mooring area protected by a rubble-mound breakwater enclosure and a small breakwater sand trap. Alternative 1 includes a long west breakwater and dogleg and an interior breakwater to protect boats moored at the mouth of Cowles Creek. An arrowhead breakwater configuration is planned for Alternatives 3, 3b, and 4. The interior basin configurations with each alternative were developed considering the restrictions of bedrock, existing park facilities, environmental concerns, and the safe harbor requirements of the anticipated fleet. Plans for each alternative are shown on Plates 12-16, Appendix H.

COASTAL PROCESSES

B3. GENERAL

The natural processes which influence the coast of Geneva State Park were considered in developing each design alternative. The wave climate, lake level fluctuations, current patterns, and littoral transport dictate the design requirements. These processes have continued since post-glacial periods to modify the shore and will continue after harbor construction. The engineering soundness and environmental suitability of the project depends on how well it responds to these natural processes.

B4. LAKE LEVELS

The water levels in Lake Erie Basin have changed much in post-glacial times. This is due to crustal uplift, climatic changes, and the diversion of outlets. The present outlet, the Niagara River, is controlled by a bedrock threshold at Buffalo, NY, which is slowly rising due to isostatic rebound of the crust. After glacial retreat, the Niagara outlet was opened, but due to crustal downwarping caused by the weight of the glaciers, this outlet was more than 100 feet lower than it is today.

B5. As the glaciers advanced and wanned and as the outlets changed, the lakes which have occupied the present Erie Basin have had water levels which are both higher and also lower than the present level. Modern Lake Erie has existed for approximately 3,500 years and the average lake level has been rising ever since at an approximate rate of 1 foot per 300 years.

B6. Modern Lake Erie water levels are also influenced by periodic fluctuations as the water content in the basin increases and decreases in response to major climatic fluctuations and seasonal variations. The lake level at a particular point along the shore also changes as strong winds or barometric changes cause the water surface to oscillate.

B7. WINDS

Winds from the west through north to northeast directions are responsible for the local wave climate and the direction of littoral drift in the reach from Ashtabula to Fairport Harbor, OH. The magnitude, proportion of total time, and direction of the wind is indicated on wind diagrams for both the Ashtabula and the Fairport stations (Figures B1 and B2).

B8. WAVE CLIMATE

The wave climate experienced at Geneva State Park mirrors the wind diagrams. Winds from the southwest through south to east directions approach the project site from the land and are not significant in generating local waves. Winds which approach from the west through north to northeast travel across a long stretch of open water and tend to be strong and of long duration. Winds from the east are less dominate. Consequently, the local wave climate is dominated by waves from the west through north to northeast. These waves are more frequent and also have greater design height than waves from the east.

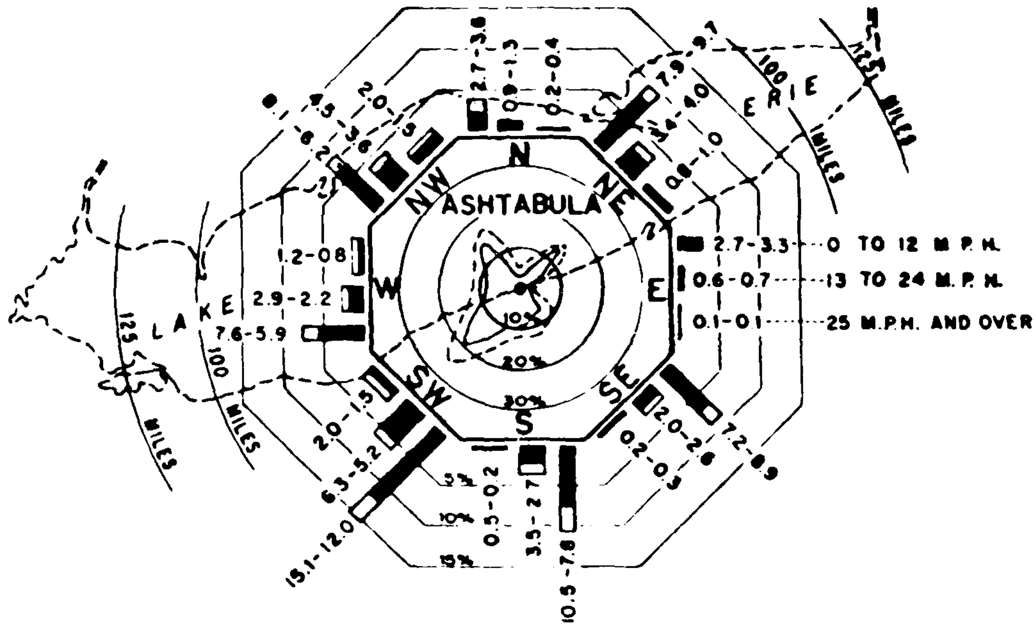
B9. Deepwater wave characteristics for Geneva State Park, OH, were obtained from Technical Report H-76-1 entitled "Design Wave Information for the Great Lakes (Report 1)," published by the Waterways Experiment Station, and in accordance with the guidance outlined in paragraph 7.1 of the Shore Protection Manual published by the Coastal Engineering Research Center in 1973. Design wave conditions are further discussed under the "Design Criteria" section of this appendix.

B10. COAST BETWEEN FAIRPORT AND ASHTABULA

The coast between Fairport and Ashtabula is here described as a single littoral cell containing a balanced sediment budget. Harbor structures at Fairport, OH, prevent littoral material from entering or leaving at the west end, and those at Ashtabula, OH, prevent material from entering or leaving at the east end. Thus, the sediment budget must be balanced for the reach between Fairport and Ashtabula Harbors. The straight coast between Fairport and Ashtabula Harbors can be considered as a closed system with all nearshore transport sources and sinks accountable.

B11. The shoreline is disrupted by a number of artificial structures including numerous groin variations. In addition to the structures, there are minor headlands, bluff areas, and intermittent low erosion marsh areas. The combination gives a moderately undulating appearance to the shore. The headlands, in general, appear to reflect underlying bedrock highs.

B12. The bluffs between Fairport and Ashtabula are 5 to 60 feet high and average about 40 feet high. The general surficial sequence is till unconformably upon shale and overlain by glaciolacustrine silts. Glaciolacustrine



WIND DIAGRAM FOR ASHTABULA, OHIO

NOTES

INDICATES DURATION FOR ICE-FREE PERIOD (MAR. TO DEC. INCL.) IN PERCENT OF TOTAL DURATION.

INDICATES DURATION FOR ICE PERIOD (JAN. TO FEB. INCL.) IN PERCENT OF TOTAL DURATION.

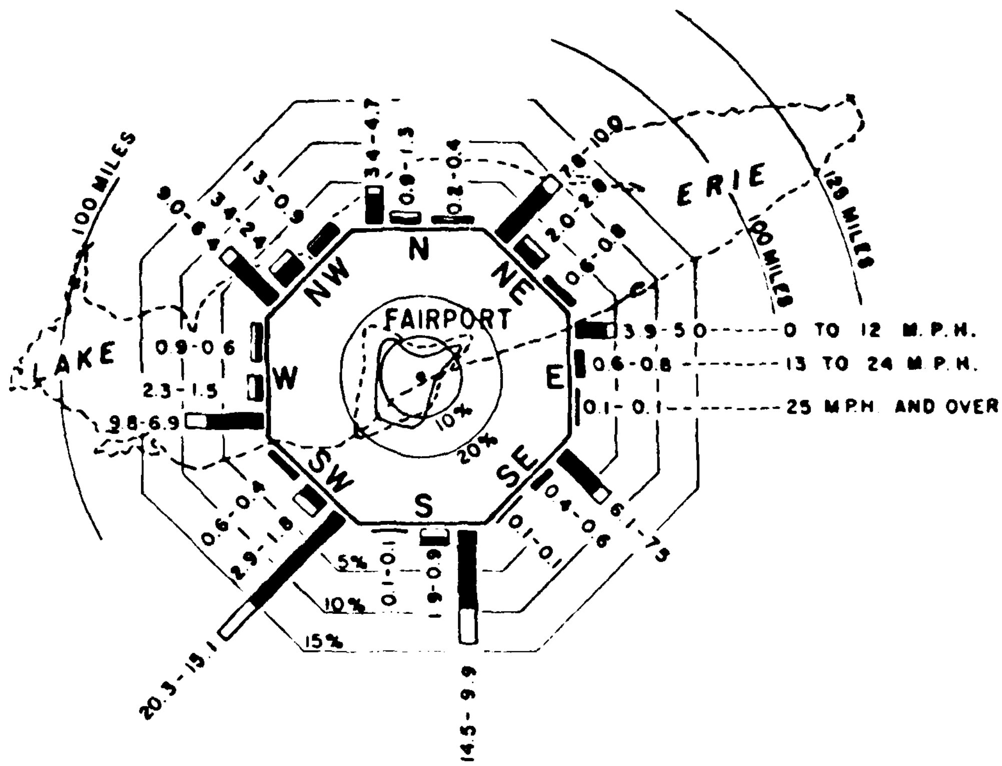
INDICATES PERCENT OF TOTAL WIND MOVEMENT OCCURRING DURING ICE-FREE PERIOD.

INDICATES PERCENT OF TOTAL WIND MOVEMENT OCCURRING DURING COMBINED ICE AND ICE-FREE PERIODS.

FIGURES AT ENDS OF BARS INDICATE PERCENT OF TOTAL WIND DURATION FOR ICE-FREE PERIOD AND COMBINED ICE-FREE AND ICE PERIODS, RESPECTIVELY.

WIND DATA BASED ON RECORDS OF THE U. S. COAST GUARD LIFE BOAT STATION AT ASHTABULA, OHIO FOR PERIOD 1 JAN. 1937 TO 31 DEC. 1968 INCL., LESS 1944, AND 1960.

Figure B1



WIND DIAGRAM FOR FAIRPORT HARBOR, OHIO

NOTES

INDICATES DURATION FOR ICE-FREE PERIOD (MAR. TO DEC. INCL.) IN PERCENT OF TOTAL DURATION.

INDICATES DURATION FOR ICE PERIOD (JAN. TO FEB. INCL.) IN PERCENT OF TOTAL DURATION.

INDICATES PERCENT OF TOTAL WIND MOVEMENT OCCURRING DURING ICE-FREE PERIOD.

INDICATES PERCENT OF TOTAL WIND MOVEMENT OCCURRING DURING COMBINED ICE AND ICE-FREE PERIODS.

FIGURES AT ENDS OF BARS INDICATE PERCENT OF TOTAL WIND DURATION FOR ICE FREE PERIOD AND COMBINED ICE-FREE AND ICE PERIODS, RESPECTIVELY.

WIND DATA BASED ON RECORDS OF THE U.S. COAST GUARD AT FAIRPORT HARBOR, OHIO FOR PERIOD 1 FEB. 1932 TO 31 JAN. 1942 AND 1 JAN. 1949 TO 31 DEC. 1971.

Figure B2

sand and gravel deposits sometimes top the silt. The thickness and presence of each layer varies from location to location.

B13. On the average, approximately 25-30 percent of the material exposed in the bluffs is potential beach-building sediment. Eroding lacustrine deposits exposed in the bluffs supply fine sand while the till supplies sand and coarser-sized material to the beaches. The streams between Fairport and Ashtabula carry little sand to the lake. Their drowned mouths act as settling basins for all but the very finest fractions.

B14. In general, the beaches are composed of medium to very coarse-grained subangular to subrounded, well-sorted lithic and quartz sand. The beaches between Fairport and Ashtabula lie upon the shale and have an average thickness of about 3 feet. The width of the active littoral sediment band between the bluffs and offshore shale bottom is generally less than 300 feet. The average grain size of the littoral material decreases offshore. Due to the shale controlled offshore, the bottom slope is only three to four degrees within 50 feet of the shoreline. Thus, a small change in lake level can drastically affect the location of the shoreline.

B15. <u>SEDIMENT SOURCES AND BLUFF RECESSION</u>

Shore erosion between Fairport and Ashtabula is due primarily to wave erosion and mass wasting (gravity transport). In general, wave erosion is the more significant process.

B16. Shore accumulation is the result of beach material being supplied to the shore area faster than it is removed. Beach-building material could be supplied by river input, onshore movement of offshore sands, and/or bluff recession. Due to the drowned river mouths and a lack of any sand in the offshore, it is assumed that most littoral material in the Geneva State Park area is supplied by recession of the bluffs between Fairport and Ashtabula.

B17. Bluff recession is a chronic condition between Fairport and Ashtabula. Wave attack removes slumped material which promotes additional mass wasting. If the failed soil had remained at the base of the bluff, it would serve as a toe, protecting the bluff from further failure and allowing the bluff face to eventually assume a stable slope.

B18. The nature of the mass wasting is strongly influenced by the nature of the bluff material. The clayey tills tend to fail due to debris flows. Water percolates down from the overlying ground surface and/or runs along silty seams saturating the clay. This results in saturated conditions for the soil mass and creates seepage forces which, along with the steepness of the bluff, reduces its stability. This instability results in slope failure along the bluff face.

B19. The well-sorted lacustrine silts fail most commonly as small rotational slumps or by block failure. Tension cracks form behind the surface of the bluff due to the steepness, surface unloading, and soil expansion-contraction. The bluff face deteriorates as downward percolating water loosens blocks of soil and gravity causes them to fall. The process is accelerated during high lake level when the bluff base is undercut by wave attack and support to the overlying bluff face is lost. Both types of

failure can be observed in the bluffs of Geneva State Park. The various mechanisms responsible for bluff recession influence the recession rates.

B20. Bluff recession rates between Fairport and Ashtabula vary from less than 1 foot per year to up to 7 feet per year (just east of Fairport). On the average, the bluffs in the Geneva State Park area are 10 to 20 feet high, comprised of till overlain by lacustrine silts, and are receding at a rate less than 1 foot per year. However, this recession rate is quite variable with time and location along the shoreline. During a year of high lake level, many feet of bluff may be lost and the recession rates increase to in excess of 10 feet per year, while during a year of low lake levels, the recession rate may drop to zero. A particularly high, steep bluff may recede quite rapidly while a neighboring low, vegetated bank may show no visible recession for the same period of time.

B21. The amount of bluff recession between Fairport and Ashtabula has an important impact on the amount of beach material available for littoral transport. Generally, the till exposed in the bluff contains 80 percent silt and clay, 15 percent sand, and 5 percent gravel. The lacustrine silts and clays contain less than 5 percent sands and gravels. The sporatic sandy zones, which in some areas form the entire bluff and in some other areas appear only as a thin layer on top of the silts and clays, are over 80-90 percent beach-building material. On the average, 25-30 percent of the total bluff face is potential beach-building material.

B22. <u>LITTORAL TRANSPORT RATES</u>

Sediment available for littoral transport can enter the nearshore system from stream input, onshore movement of offshore sands, and bluff recession. The Federal harbors at Fairport and Ashtabula bracket the littoral reach which includes Geneva State Park and has an internally complete sediment budget. In other words, what erodes from one portion of this reach must accrete somewhere else within the same reach.

B23. Between Fairport and Ashtabula most of the streams are small (Cowles Creek has a drainage of 23 square miles) and have drowned, estuarine lower reaches which act as settling basins for much of the stream's sediment load. Thus, little but the very finest fraction of fluvially transported material reaches the lake.

B24. Sampling results (Appendix A) indicate that there are no sands offshore of the beach zone which are available for onshore transport. Thus, the offshore is probably not a significant source of littoral material. All the known field evidence and researched literature suggests that almost all of the material available for littoral transport is supplied by bluff recession.

B25. In order to develop a reasonable "ballpark" estimate of littoral transport rates between Fairport and Ashtabula, it was necessary to make the following assumptions:

a. That the drift rate is controlled directly by the amount of material available for transport (typically the wave energy is capable of transporting all the available littoral material);

b. That the primary source of littoral material is bluff recession; and

c. That the major permanent littoral sink for this 26-mile long section of coast is the fillet at Ashtabula Harbor. Other losses to the drift regime are limited to temporary storage in fillets associated with groin fields and small beaches, and offshore losses where small creeks blow through littorally deposited bars diverting drift out into small offshore deltas.

B26. With these assumptions, a number of different approaches were taken to determine the littoral transport rates. The littoral accumulation rate at the Ashtabula Harbor west breakwater is 4,148,000 cubic yards between 1876 and 1974, or 42,326 cubic yards per year (Ashtabula Harbor Section 111, 1977). The annual littoral input due to bluff recession between Fairport and Ashtabula was calculated from the bluff recession rates, bluff heights, reach length, and geology presented in Carter, 1977, "Sediment-Load Measurements Along the United States Shore of Lake Erie," ODNR Report No. 102. Bluff recession contributed 16,370 cubic yards per year between Ashtabula and Geneva State Park, and 33,314 cubic yards per year between Geneva State Park and Fairport. Thus, the total bluff recession input to the littoral regime is approximately 50,000 cubic yards per year. This number is quite compatible with the observed accumulation rate at Ashtabula Harbor.

B27. An evaluation was made of the wave energy per littoral transport direction by interpolating from Saville, 1953 "Wave and Lake Level Statistics for Lake Erie," BEB TM No. 37, Statistical Energy Data Per Direction for Ice-Free Period for Cleveland, OH, and Erie, PA. The data was compiled and weighed according to the wave approach angle with the shoreline. This evaluation suggests that 67 percent of the wave energy comes from a westerly direction (promotes easterly drift), and 33 percent comes from an easterly direction (promotes westerly drift). If the gross drift is assumed at 50,000 cubic yards per year, then the net drift to the east is approximately 33,500 cubic yards per year, and the net drift to the west is approximately 16,500 cubic yards per year.

B28. In summary, preliminary estimates suggest that approximately 30,000 to 50,000 cubic yards per year of littoral drift passes Geneva State Park. About two-thirds of this material is moving west to east. Onshore movement is insignificant. As the sediment sampling results indicate a clean bedrock surface exists lakeward of the -3 LWD contour, it is assumed that offshore transport is minor. However, at Cowles Creek some littoral material is periodically diverted offshore forming an offshore delta.

B29. MINIMIZING IMPACTS ON THE COASTAL PROCESSES

Any feature which protrudes from the shoreline will impact upon the local coastal processes. The local wave climate and current pattern and the resultant sediment transport will be modified. Each of the alternative harbor plans will trap littoral transport on the west side of the harbor structures and deprive the eastern shores of sediment. The area contained within the protection of the breakwater structures will no longer contribute sediment to the nearshore by shoreline recession. Currents will travel around the structure ends promoting more offshore transport of the nearshore sediment.

B30. To minimize downdrift impacts and reduce the offshore sand transport, each formulated plan, includes the provision for sediment bypassing. Material will be transported from the updrift side of the west structure to the downdrift side of the east structure on a periodic basis. Frequent bypassing will reduce the offshore losses caused by an extensive lakeward buildup of the subaqueous beach face. Individual storms may cause damage to the areas immediately downdrift of the harbor structures between bypassing operations. In the case of Alternative 1, the bluff area to the east of the proposed structures may experience accelerated erosion between bypassing operations. Alternatives 2, 3, 3b, and 4 should have limited downdrift impacts as the area to the east is already protected by a revetment.

CONSIDERATIONS FOR ALTERNATIVE DEVELOPMENT

B31. GENERAL

The alternative plans which were developed include two locations for the entrance channel and for breakwater construction, one at Cowles Creek and the other just west of the bathhouse. Each alternative was designed in consideration of the known geologic, hydraulic, environmental, and sociological constraints

B32. BREAKWATER SYSTEM

The proposed breakwater system is designed to maintain an entrance free from littoral drift and create a safe navigation entrance channel from Lake Erie into the inner harbor area. Thus, the entrance structures must provide a relatively impermeable barrier that prohibits littoral drift from passing through, over, or around them.

B33. Rubblemound construction with a side slope of 1.0 vertical on 1.5 horizontal was used for the structure design during Stage 2 planning. During Stage 3 design of Plan 3b, the side slopes were subsequently changed to 1.0 vertical on 2.0 horizontal on the lake side and 1.0 vertical on 1.5 horizontal on the channel side. The rubblemound structures will prevent or reduce the transmission of wave energy into the entrance channel and interior harbor by absorbing most of this energy. The crest elevations for the breakwaters were designed allowing overtopping of the structures by the design waves which would regenerate a maximum 3-foot interior wave height in the entrance channel and allow no more than a 1-foot high wave in the inner harbor. The entrance structures were designed on the premise of using stone having a density of 155 pounds per cubic foot.

B34. The rubblemound structures have a protective stone armored outer layer, an underlayer of smaller sized stone, and a bedding layer. The integrity of the rubblemound structures is largely dependent upon the stability of the stone placement. Therefore, a bedding layer of spalls or quarry waste will be placed on the bottom of the lake to prevent the large armor stone from sinking into the bottom, particularly in the nearshore, and thereby losing their usefulness. Should later studies reveal that the breakwater foundation beyond the littoral zone is exposed bedrock, the structure cross section will be modified accordingly.

B35. ENTRANCE CHANNEL

The harbor entrance must be oriented so that the entrance channel allows a reasonable line of approach for boats during storm conditions. The entrance channel must be wide enough and deep enough to allow two-way traffic of the total recreational fleet. Experience with similar small-boat harbor projects in the Buffalo District and a workshop held with the boating public during Stage 3 studies have indicated that a 100-foot wide, 8-foot deep entrance is sufficient to meet this requirement. The entrance channel was designed to be relatively straight with two oblique turns in the inner channels for entrance into the mooring area.

B36. INNER HARBOR

The inner harbor mooring area must be of sufficient size to provide docking for 360 boats and include the necessary support facilities. (Note: The harbor mooring area and necessary support facilities were sized for 400 boats during Stage 2 planning.) Wave heights in the inner harbor must not exceed 1 foot. Therefore, the enclosed mooring basin must be of a geometry and contain wave absorbing surfaces sufficient to limit internal wave oscillation and amplification. The proposed harbor geometry is, of necessity due to bedrock limitations, generally rectangular with right angles. In order to reduce the subsequent tendency for wave reflection off of opposite walls, sloped side walls were proposed wherever feasible. Sloped, riprap walls will absorb the trapped wave energy. A hydraulic model study is presently underway and may indicate that additional wave absorption is necessary. In that case, variations in the basin geometry, additional sloped walls, and wave absorbing vertical wall units (i.e., IGLOO's, cinder blocks) would be tested in the model.

B37. SUMMARY

The final design consideration is the economic, environmental, and sociological suitability of the design. The design must minimize adverse environmental impacts to the shoreline, the interior drainage system, and to the offshore. Not only must the design have a satisfactory benefit-cost ratio, but it should be as cost effective as practical considering the other restrictions. Finally, the proposed harbor plan must merge with the existing park facilities and user patterns to provide an appealing recreational center.

B38. Each of the previously mentioned restrictions were considered in developing the alternative plans. The selected plan, Plan 3b, is presently being tested in a hydraulic model study at the Corps of Engineers Waterways Experiment Station. During this model study, the orientation and design of the breakwater structures, the entrance channel plan, and the inner harbor configuration will each be evaluated and manipulated as necessary to refine the design of the recommended plan. Additional subsurface data will also impact upon the final design.

DESIGN CRITERIA

B39. GENERAL

In general, the western structure for each alternative was designed assuming direct wave attack from angle classes 2 and 3. The eastern structure was designed assuming a wave attack from either angle class 2 or angle class 1 and 2, depending on the alternative. The discussion on design criteria presented below is specific to the harbor plan selected for additional detailed study - Plan 3b. Similar criteria was used for design of Alternative Plans 1, 2, 3 and 4 during Stage 2 planning. A discussion on this Stage 2 design criteria is presented in the Stage 2 Report for this project.

B40. The entrance structures for Plan 3b were analyzed using the 10-year and 20-year recurrence significant deep water wave heights at Geneva, OH (Grid Point 14) as determined by Waterways Experiment Station and published in Technical Report H-76-1 "Design Wave Information for the Great Lakes - Report 1 - Lake Erie." Table B4 of this appendix presents the significant deepwater wave heights for various recurrence intervals at Geneva and Table B5 presents the wave periods associated with these wave heights. Angle class 1 in Tables B4 and B5 correspond to waves from the east-northeast (ENE) through north (N), angle class 2 to waves from the north (N) through west-northwest (WNW), and angle class 3 corresponds to waves from the west-northwest (WNW) through west-southwest (WSW).

B41. The designed structures are of standard rubblemound design. In accordance with a 4 May 1976 guidance letter provided by NCDED-H for use of WES Technical Report H-76-1, for coastal projects having a 50-year design economic lifetime, a combined lake level and deep water wave corresponding to a 200-year recurrence event is recommended. The GODA2 computer program as provided by CERRE-CS on 16 July 1979 was used to analyze the wave conditions which occur for each season with the combination of a 10-year lake level and 20-year waves and the combination of a 20-year lake level and 10-year waves. The results from the analysis are shown in Tables B1 and B2. For structural design, the maximum wave height (H_{max}) for each breakwater section will be used. A two-dimensional stability test may be conducted by the Corps Waterways Experiment Station to verify the optimal stone size. The boating season at Geneva-on-the-Lake is assumed to extend from April to November, therefore, the crest height of the structures is designed using the largest significant wave height (H_{sig}) which can occur during the boating season. The physical model and two dimensional stability test will also be used to verify the crest elevation of the structures.

B42. A refraction analysis performed by the Buffalo District for the "Geneva State Park, OH; Shore Erosion Demonstration Project Pre-Construction Report" (February 1978) was modified to provide the appropriate refraction coefficients and pattern at the project site.

B43. DESIGN LAKE LEVEL (DLL)

The design lake level is a combination of the joint occurrence of long-term average lake level with a short term rise due to a storm setup. The water

Table B1 - Wave Analysis Results for Head Sections

EAST BREAKWATER

Head Section

Season	Spring						Summer						Fall						Winter					
Lake Level	10-Year			20-Year			10-Year			20-Year			10-Year			20-Year			10-Year			20-Year		
d_s	11.5'			11.9'			11.4'			11.8'			11.0'			11.4'			10.8'			11.2'		
Angle Class	$\measuredangle_1$	$\measuredangle_2$	$\measuredangle_3$	$\measuredangle_1$	$\measuredangle_2$	$\measuredangle_3$	$\measuredangle_1$	$\measuredangle_2$	$\measuredangle_3$	$\measuredangle_1$	$\measuredangle_2$	$\measuredangle_3$	$\measuredangle_1$	$\measuredangle_2$	$\measuredangle_3$	$\measuredangle_1$	$\measuredangle_2$	$\measuredangle_3$	$\measuredangle_1$	$\measuredangle_2$	$\measuredangle_3$	$\measuredangle_1$	$\measuredangle_2$	$\measuredangle_3$
Wave Height (H_o)	4.6'	7.5'	*	3.6'	5.9'	*	6.6'	6.6'	*	5.2'	5.9'	*	9.8'	12.1'	*	9.2'	11.5'	*	9.8'	13.4'	*	8.2'	12.1'	*
Significant Wave Height (H_{sig})	2.9'	6.3'	*	2.2'	5.2'	*	4.1'	5.8'	*	3.1'	5.4'	*	6.0'	7.0'	*	5.7'	7.0'	*	5.9'	6.8'	*	5.1'	7.2'	*
Maximum Wave Height (H_{max})	4.5'	8.2'	*	3.5'	7.9'	*	6.6'	8.0'	*	5.1'	7.9'	*	8.0'	8.5'	*	8.1'	8.7'	*	7.9'	8.4'	*	7.7'	8.7'	*

WEST BREAKWATER

Head Section

Season	Spring						Summer						Fall						Winter					
Lake Level	10 Year			20-Year			10-Year			20-Year			10-Year			20-Year			10-Year			20-Year		
d_s	16'			16.4'			15.9'			16.3'			15.5'			15.9'			15.3'			15.7'		
Angle Class	$\measuredangle_1$	$\measuredangle_2$	$\measuredangle_3$	$\measuredangle_1$	$\measuredangle_2$	$\measuredangle_3$	$\measuredangle_1$	$\measuredangle_2$	$\measuredangle_3$	$\measuredangle_1$	$\measuredangle_2$	$\measuredangle_3$	$\measuredangle_1$	$\measuredangle_2$	$\measuredangle_3$	$\measuredangle_1$	$\measuredangle_2$	$\measuredangle_3$	$\measuredangle_1$	$\measuredangle_2$	$\measuredangle_3$	$\measuredangle_1$	$\measuredangle_2$	$\measuredangle_3$
Wave Height (H_o)	4.6'	7.5'	9.2'	3.6'	5.9'	7.9'	6.6'	6.6'	8.2'	5.2'	5.9'	7.2'	9.8'	12.1'	12.1'	9.2'	11.5'	11.5'	9.8'	13.4'	13.1'	8.2'	12.1'	12.1'
Significant Wave Height (H_{sig})	2.7'	6.8'	6.7'	2.2'	5.2'	5.8'	4.0'	5.7'	6.0'	3.2'	5.2'	5.1'	6.2'	9.0'	8.8'	5.6'	8.9'	8.4'	6.2'	9.1'	9.1'	5.0'	9.0'	8.6'
Maximum Wave Height (H_{max})	4.4'	10.2'	10.5'	3.6'	8.3'	9.1'	6.4'	9.2'	9.6'	5.0'	8.3'	8.3'	9.7'	11.3'	11.5'	9.1'	11.5'	11.6'	9.7'	11.2'	11.5'	8.1'	11.5'	11.6'

* Wave attack from this direction cannot reach the structure, therefore not analyzed.

Table B2 - Wave Analysis Results for Trunk Sections

EAST BREAKWATER

Trunk Section

Season	Spring						Summer						Fall						Winter					
Lake Level	10-Year			20-Year			10-Year			20-Year			10-Year			20-Year			10-Year			20-Year		
d_s	6.5'			6.9'			6.4'			6.8'			6.0'			6.4'			5.8'			6.2'		
Angle Class	$\measuredangle_1$	$\measuredangle_2$	$\measuredangle_3$	$\measuredangle_1$	$\measuredangle_2$	$\measuredangle_3$	$\measuredangle_1$	$\measuredangle_2$	$\measuredangle_3$	$\measuredangle_1$	$\measuredangle_2$	$\measuredangle_3$	$\measuredangle_1$	$\measuredangle_2$	$\measuredangle_3$	$\measuredangle_1$	$\measuredangle_2$	$\measuredangle_3$	$\measuredangle_1$	$\measuredangle_2$	$\measuredangle_3$	$\measuredangle_1$	$\measuredangle_2$	$\measuredangle_3$
Wave Height (H_o)	4.6'	7.5'	*	3.6'	5.9'	*	6.6'	6.6'	*	5.2'	5.9'	*	9.8'	12.1'	*	9.2'	11.5'	*	9.8'	13.4'	*	8.2'	12.1'	*
Significant Wave Height (H_{sig})	3.0'	4.1'	*	2.2'	4.3'	*	3.8'	4.1'	*	3.4'	4.1'	*	3.9'	4.2'	*	4.2'	4.4'	*	3.8'	4.1'	*	4.0'	4.3'	*
Maximum Wave Height (H_{max})	4.5'	5.2'	*	3.7'	5.2'	*	4.8'	5.0'	*	4.9'	5.2'	*	4.9'	5.3'	*	5.1'	5.5'	*	4.7'	5.2'	*	4.9'	5.4'	*

WEST BREAKWATER

Trunk Section

Season	Spring						Summer						Fall						Winter					
Lake Level	10-Year			20-Year			10-Year			20-Year			10-Year			20-Year			10-Year			20-Year		
d_s	9.5'			9.9'			9.4'			9.8'			9.0'			9.4'			8.8'			9.2'		
Angle Class	$\measuredangle_1$	$\measuredangle_2$	$\measuredangle_3$	$\measuredangle_1$	$\measuredangle_2$	$\measuredangle_3$	$\measuredangle_1$	$\measuredangle_2$	$\measuredangle_3$	$\measuredangle_1$	$\measuredangle_2$	$\measuredangle_3$	$\measuredangle_1$	$\measuredangle_2$	$\measuredangle_3$	$\measuredangle_1$	$\measuredangle_2$	$\measuredangle_3$	$\measuredangle_1$	$\measuredangle_2$	$\measuredangle_3$	$\measuredangle_1$	$\measuredangle_2$	$\measuredangle_3$
Wave Height (H_o)	4.6'	7.5'	9.2'	3.6'	5.9'	7.9'	6.6'	6.6'	8.2'	5.2'	5.9'	7.2'	9.8'	12.1'	12.1'	9.2'	11.5'	11.5'	9.8'	13.4'	13.1'	8.2'	12.1'	12.1'
Significant Wave Height (H_{sig})	2.9'	5.7'	5.8'	2.2'	5.2'	5.7'	4.2'	5.4'	5.6'	3.3'	5.2'	5.4'	5.4'	5.7'	6.0'	5.3'	6.0'	6.0'	5.4'	5.8'	5.9'	5.0'	5.9'	6.1'
Maximum Wave Height (H_{max})	4.6'	7.0'	7.3'	3.5'	7.0'	7.4'	6.4'	6.9'	7.1'	5.3'	7.0'	7.2'	6.8'	7.1'	7.3'	7.0'	7.4'	7.5'	6.7'	7.1'	7.2'	6.8'	7.3'	7.4'

* Wave attack from this direction cannot reach the structure, therefore not analyzed.

levels for this Stage 3 analysis were obtained from the "Standardized Frequency Curves for Design Water Level Determination on the Great Lakes" prepared by Detroit District in 1979. A 10-year and a 20-year water level was determined for each season and used in the GODA2 program to obtain the critical design conditions. The water levels were determined by combining the seasonal mean lake level for Lake Erie which have a 10-year and a 20-year recurrence with a short-term peak rise that has a 1-year recurrence, to obtain the seasonal 10-year and 20-year respective design lake levels. Geneva, OH, lies approximately midway between Cleveland, OH, and Erie, PA, therefore, a reasonable estimate of the peak rises was made by averaging the peak rises which can occur each season at Cleveland and Erie, to obtain the seasonal peak rise at Geneva. The lake levels which were used in the Stage 3 analysis are shown in Table B3 below.

Table B3 - Design Lake Levels

Season	Spring	Summer	Fall	Winter
10-Year Mean Level	572.6	572.5	571.6	571.6
1-Year Peak Rise	+0.5	+0.5	+1.0	+0.8
10-Year Design Water Level	573.1	573.0	572.6	572.4
20-Year Mean Level	573.0	572.9	572.0	572.0
1-Year Peak Rise	+0.5	+0.5	+1.0	+0.8
20-Year Design Water Level	573.5	573.4	573.0	572.8

B44. DESIGN DEEP WATER WAVES (Ho)

The significant deep water wave heights and associated periods which could be expected at Geneva, OH, were determined by Waterways Experiment Station and published in Technical Report H-76-1, "Design Wave Information for the Great Lakes," Report 1, dated March 1976. Table B4 shows the significant deep water wave heights at Geneva, OH, for three angle classes and for each season of the year for various recurrence intervals. The three angle classes are defined as viewed by an observer standing on shore and are distinguished below:

(1) Angle Class 1 - Mean wave approach angle greater than 30 degrees to the right of a normal to shore (east-northeast to north);

(2) Angle Class 2 - Mean wave approach angle within 30 degrees to either side of a normal to shore (north to west-northwest);

(3) Angle Class 3 - Mean wave approach angle greater than 30 degrees to the left of a normal to shore (west-northwest to west-southwest).

Table B5 gives the wave period associated with each wave height at Geneva, OH, as a function of wave direction and wave height as presented in Technical Report H-76-1.

Table B4 - Significant Deep Water Wave Heights at Geneva, OH

Table of Extremes Estimates
Grid Location 8.14 LAT = 41.52 LON = 80.98 Geneva, OH
Shoreline Grid Point 14

Winter
Angle Classes

	1	2	3	All
5	6.6 (0.7)	10.5 (0.5)	10.8 (0.4)	12.3 (0.7)
10	8.2 (0.9)	12.1 (0.7)	12.1 (0.5)	13.5 (0.9)
20	9.8 (1.1)	13.4 (0.9)	13.1 (0.6)	14.8 (1.1)
50	12.1 (1.4)	15.4 (1.1)	14.4 (0.8)	16.5 (1.4)
100	13.8 (1.6)	16.7 (1.2)	15.4 (0.9)	17.8 (1.6)

Spring
Angle Classes

	1	2	3	All
5	3.6 (0.4)	4.3 (0.7)	6.9 (0.4)	7.5 (0.8)
10	3.6 (0.5)	5.9 (1.0)	7.9 (0.6)	8.8 (1.0)
20	4.6 (0.7)	7.5 (1.2)	9.2 (0.7)	10.1 (1.2)
50	5.9 (0.8)	10.2 (1.5)	10.5 (0.9)	11.9 (1.5)
100	6.9 (0.9)	11.8 (1.7)	11.8 (1.0)	13.3 (1.8)

Summer
Angle Classes

	1	2	3	All
5	4.3 (1.9)	4.9 (0.5)	6.2 (0.8)	7.2 (2.0)
10	5.2 (2.5)	5.9 (0.7)	7.2 (1.0)	8.0 (2.7)
20	6.6 (3.2)	6.6 (0.8)	8.2 (1.3)	8.9 (3.3)
50	9.2 (3.9)	7.2 (1.0)	9.2 (1.6)	10.3 (4.1)
100	11.2 (4.5)	7.5 (1.2)	9.8 (1.8)	11.7 (4.8)

Fall
Angle Classes

	1	2	3	All
5	8.2 (0.3)	10.5 (0.4)	10.8 (0.3)	11.4 (0.4)
10	9.2 (0.4)	11.5 (0.5)	11.5 (0.4)	12.2 (0.5)
20	9.8 (0.5)	12.1 (0.6)	12.1 (0.5)	13.1 (0.7)
50	10.5 (0.6)	13.4 (0.8)	13.1 (0.6)	14.2 (0.8)
100	11.5 (0.7)	14.4 (0.9)	13.8 (0.7)	15.1 (0.9)

Table B5 - Significant Period by Angle Class and Wave Height

Grid Location 8.14 LAT = 41.52 LON = 80.98 Geneva, OH
Grid Point Number 14
Significant Period by Angle Class and Wave Height

Wave Height (Feet)	Angle Class 1	Angle Class 2	Angle Class 3
1	2.3	2.3	2.5
2	3.6	3.6	3.8
3	4.5	4.5	4.8
4	5.2	5.2	5.5
5	5.8	5.8	6.1
6	6.1	6.1	6.5
7	6.3	6.4	6.9
8	6.6	6.6	7.3
9	6.9	6.9	7.7
10	7.2	7.2	8.2
11	7.4	7.5	8.6
12	7.7	7.8	9.0
13	8.0	8.0	9.4
14	8.2	8.3	9.8
15	8.5	8.6	10.2
16	8.8	8.9	10.6
17	9.0	9.2	11.0
18	9.3	9.4	11.4
19	9.6	9.7	11.8
20	9.9	10.0	12.3
21	10.1	10.3	12.7
22	10.4	10.6	13.1
23	10.7	10.8	13.5
24	10.9	11.1	13.9
25	11.2	11.4	14.3

In accordance with a 4 May 1976 Guidance letter provided by NCDED-H for use of WES Technical Report H-76-1, for coastal projects having a 50-year design economic lifetime, a combined lake level and deep water wave corresponding to a 200-year recurrence event is recommended. Therefore, during Stage 3, waves with a 10-year and a 20-year recurrence for each season were used in the GODA2 program with the respective 20-year and 10-year seasonal design water levels to obtain the critical design conditions.

B45. <u>REFRACTION AND SHOALING ANALYSIS</u>

A refraction analysis was conducted using a computer model developed by R. S. Dobson (Waterways Experiment Station) for his M. S. Thesis at Stanford University. The water wave refraction program was used to solve the governing equations that describe the propagation of the design waves from deep water into shallow water. The refraction analysis developed by the Buffalo District for the Geneva State Park Shore Erosion Demonstration Project was rerun at only a deep water level for the small-boat harbor project without a nearshore detailed "window." Input control parameters such as period, design lake level, ray designation, and wave heights were modified to suit this small-boat harbor design. Refraction diagrams for deep water waves from the west, north-northwest, and north-northeast directions are shown on Figures B3, B4, and B5, respectively.

B46. <u>DESIGN STRUCTURE DEPTH</u> (ds)

The east and west breakwaters for Plan 3b were each analyzed at two locations, the structure head and the structure trunk. The design structure depth (ds) of the structure toe at critical cross section locations were determined from soundings obtained in the summer of 1979. The design structure depth at the head section for each breakwater was determined at the depth contour at the outer end of the breakwaters while the design structure depth at the trunk section for each breakwater was determined at the average depth contour over the reach of the breakwater trunk. The depth contours used for each section are shown below in Table B6. The sounding at the structure toe plus the design lake level minus the low water datum elevation equals the design depth of water at the structure toe (ds).

ds = Sounding + DLL - LWD
where LWD = 568.6

The design structure depth values used in the analysis are shown in Tables B1 and B2.

Table B6 - Design Depth Contours

	Head Section	Trunk Section
West Breakwater	11.5 Feet	5.0 Feet
East Breakwater	7.0 Feet	2.0 Feet

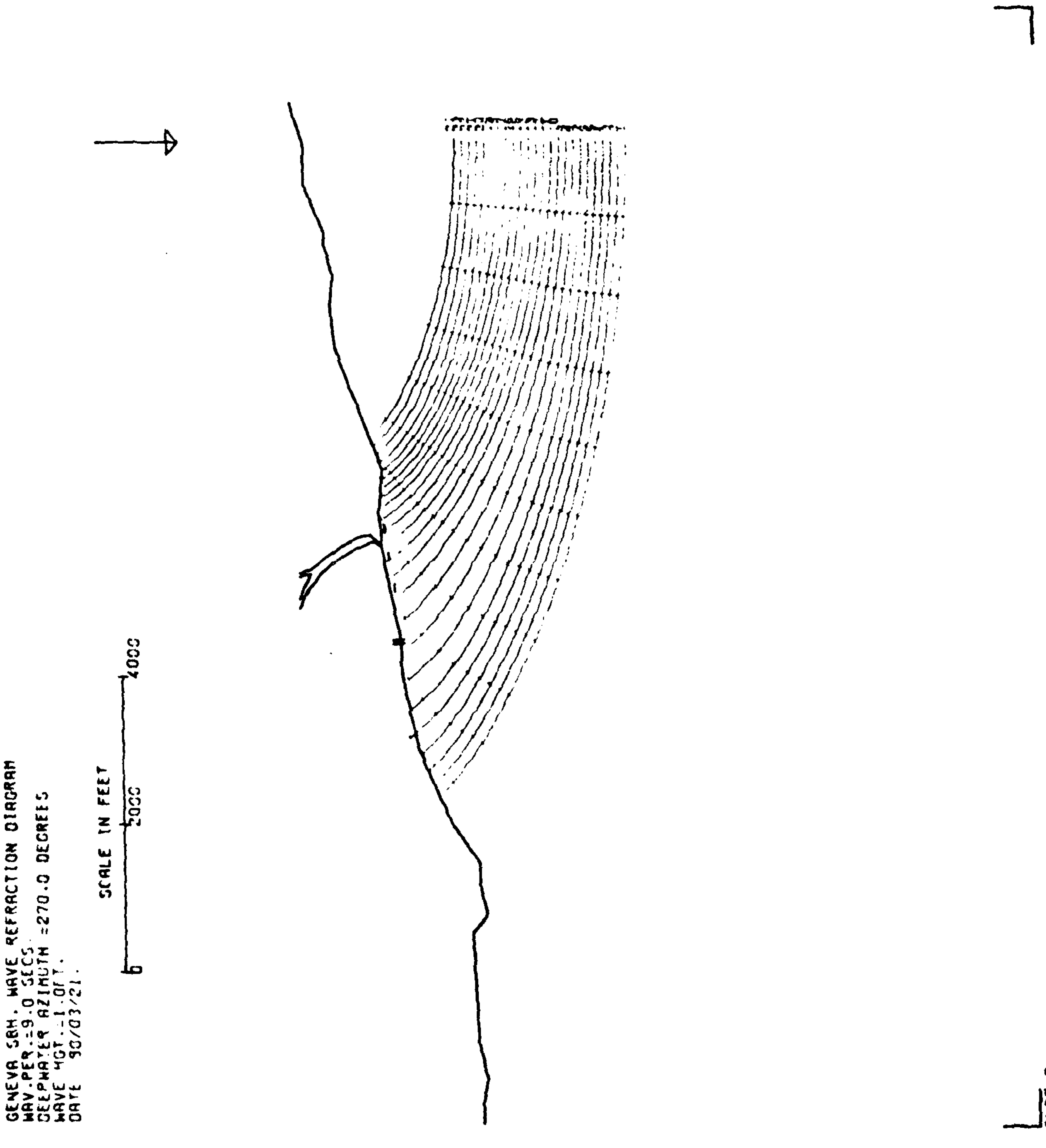


Figure B3 - Refraction Diagram for West Direction

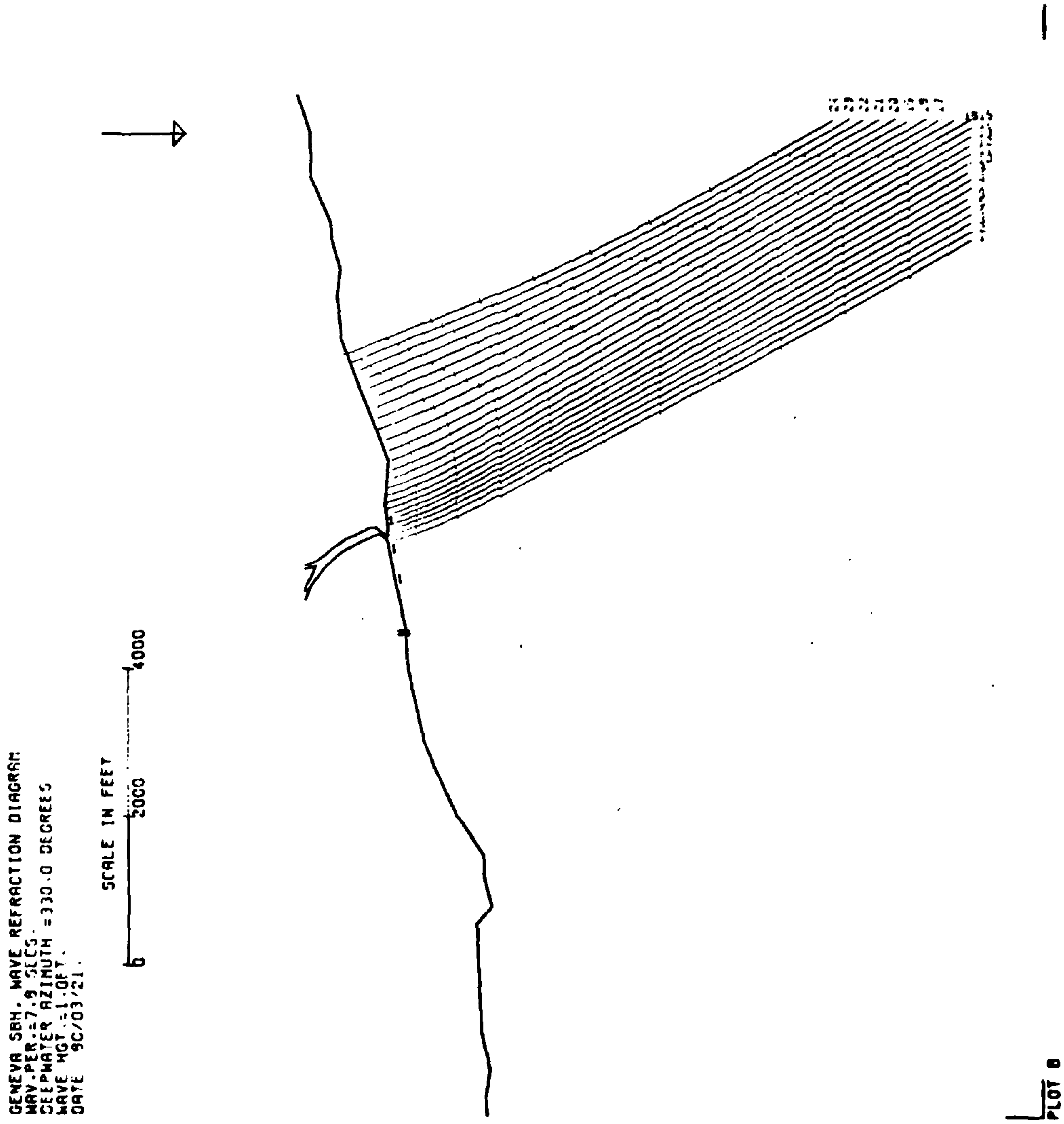


Figure B4 - Refraction Diagram for North-Northwest Direction

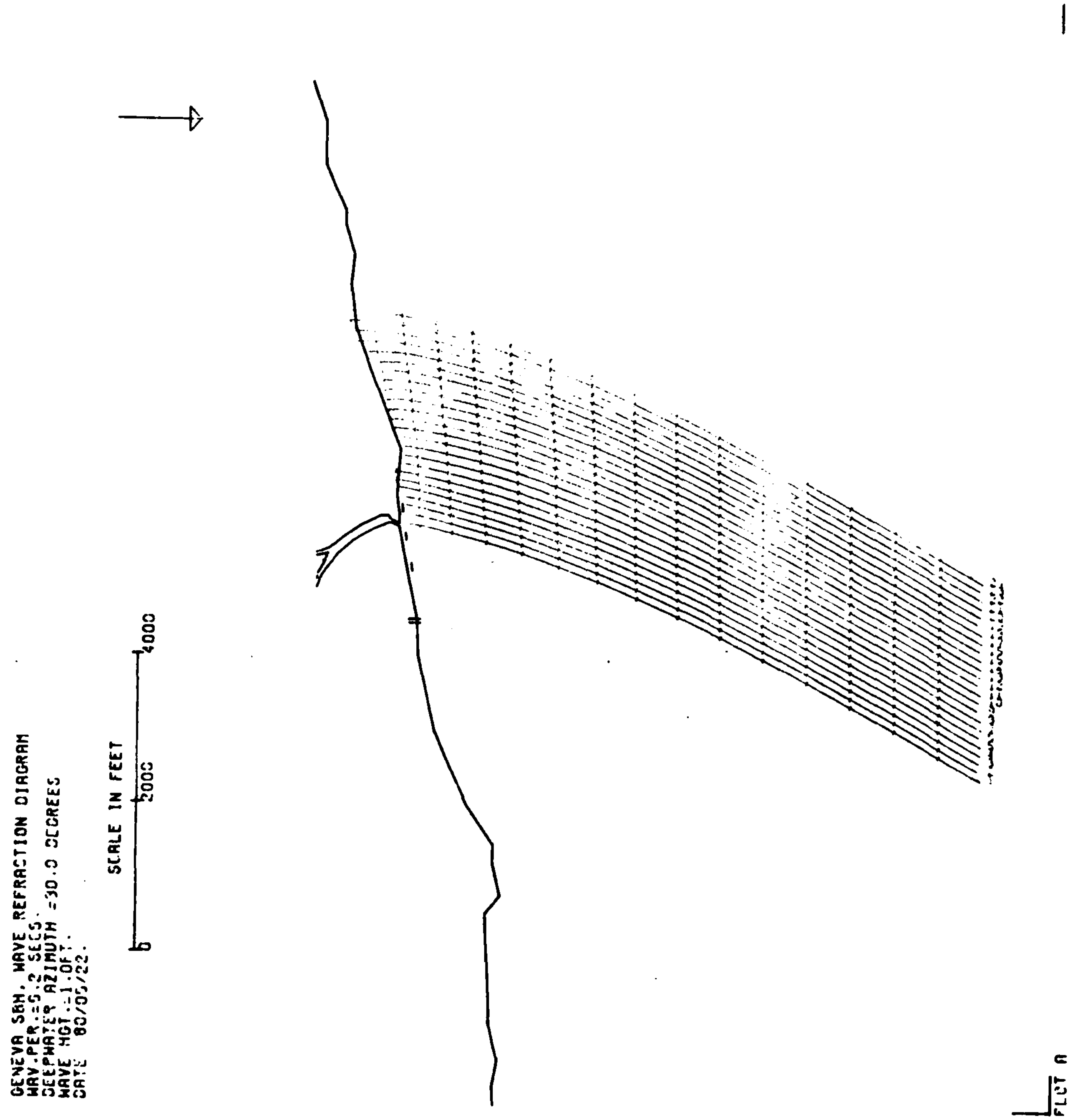


Figure B5 - Refraction Diagram for North-Northeast Direction

B47. DESIGN INCIDENT WAVES

The design incident waves were computed by using the GODA2 computer program. The results from the analysis are shown in Tables B1 and B2. The height (H_{max}) for the head and trunk sections as shown in Table B7 below will be used for structural design.

Table B7 - Design Maximum Wave Height

	Head Section	Trunk Section
West Breakwater	11.6 Feet	7.5 Feet
East Breakwater	8.7 Feet	5.5 Feet

B48. The crest height for the east and west breakwater is designed to allow overtopping which would regenerate a maximum interior wave (transmitted wave) of 3.0 feet in the entrance channel. Since the transmitted wave height is only of concern during the boating season, the largest significant wave heights (H_{sig}) which occur during the spring, summer, or fall as obtained from Tables B1 and B2 are used in the wave analysis for determining crest height. The wave parameters used to determine the crest heights of the breakwaters are summarized below in Table B8.

Table B8 - Design Wave for Crest Height

	H_{sig} (Ft.)	H_o (Ft.)	T (Sec)	K_R
West Breakwater				
Head Section	9.0	12.1	7.8	0.90
Trunk Section	5.7	12.1	7.8	0.89
East Breakwater				
Head Section	7.0	12.1	7.8	.89
Trunk Section	4.2	12.1	7.8	.89

B49. STONE SIZE COMPUTATION

Armor unit design was calculated by application of Hudson's formula, Shore Protection Manual, Section 7.373.

$$W = \frac{Wr\ H^3}{K_D\ (Sr-1)^3\ \text{Cot}\ \theta}$$

Where:

W = Weight of armor unit in primary cover layer (lbs.)
Wr = Stone density in lbs/ft^3, assume Wr = 155 pcf
H = Incident design wave height at the structure (ft.)
K_D = Stability coefficient of the armor layer
  K_D = 2.8 for nonbreaking wave at structure head
  K_D = 2.5 for breaking wave at structure head
  K_D = 4.0 for nonbreaking wave at structure trunk
  K_D = 3.5 for breaking wave at structure trunk
Sr = Specific gravity of armor stone = 155/62.4 = 2.48
Cot θ = Structure side slope = 2.0

B50. Layer thickness is computed by

$$r = n_1 K_\Delta \left(\frac{W}{Wr}\right)^{1/3}$$

Where:

r = Average layer thickness in feet
n_1 = Number of stones comprising cover layer = 2
K_Δ = Layer coefficient = 1.15 for two layers of rough quarry stone
W = Weight of an individual armor stone in cover layer
Wr = Stone density = 155 pcf

B51. Crest width is computed by

$$B = n_2 K_\Delta \left(\frac{W}{Wr}\right)^{1/3}$$

Where:

B = Crest width, ft.
n_2 = Number of stones in crest width = 3
K_Δ = Layer coefficient = 1.15 for 2 layers of rough quarry stone
W = Weight of an individual armor stone in cover layer
Wr = Stone density = 155 pcf

B52. As the computed W is design weight for individual armor units of a primary layer and the construction is a two-layer structure with a natural deviation to the specified W, it is reasonable to compute a range of stone sizes. The underlayer and bedding layer stone size is also computed as a range which is a function of the W.

B53. Armor Stone:

W max = 2.0 W
W min = 0.9 W

B54. Underlayer Stone:

$W\ max = 0.2\ W$
$W\ min = 0.06\ W$
$$r = n_1 K_\Delta \left(\frac{0.1\ W}{Wr}\right)^{1/3}$$

B55. Bedding Stone:

$W\ max = 0.01\ W$
$W\ min = 0.00015\ W$

B56. CREST HEIGHT COMPUTATION

The wave runup on the entrance structures was determined by using the method in Section 7.21 of the Shore Protection Manual (SPM) and reduced using GODA's charts, as directed by NCDED-C guidance dated 22 August 1978, to calculate the wave heights at the toe depth for the 1.0 vertical on 10.0 horizontal or flatter lake bed slope at Geneva, OH. The wave runup was used in computing the required crest elevation which, when overtopped, would yield a maximum three-foot transmitted wave in the entrance channel and a maximum one-foot wave in the mooring area. The Cross and Sollitt method was used in computing the required crest heights.

$$Hbi = R\ (1.04 - Ht/0.54\ Hi)$$

Where:

Hbi = breakwater height
R = wave runup
Ht = height of transmitted wave
Hi = height of incident wave

and

Crest Elevation = DLL + Hbi

Where DLL = 572.6 - 568.6 = +4.0 ft. for 10-year fall season level.

DETAILED DESIGN

B57. GENERAL

A detailed design was prepared for each alternative plan to compute the crest height, stone size, and layer thickness for each proposed breakwater structure. A 1.0 vertical on 2.0 horizontal sideslope is used on the lake side of the breakwaters whereas a 1.0 vertical on 1.5 horizontal sideslope is used on the channel side of the breakwaters for Plan 3b. A 1.0 vertical on 1.5 horizontal sideslope was used on both sides of the breakwaters for Plans 1, 2, 3, and 4. Only the calculations for the selected plan, Plan 3b, are shown. Typical sections for the east and west breakwaters are shown on Figures B6 through B9 at the end of this Appendix.

BY K. Gorecki DATE 9/29/80 SUBJECT Geneva, OH - Small Boat Harbor - PLAN 3B SHEET NO. 1 OF
CHKD. BY [illegible] DATE 10/1/80 JOB NO.

PLAN 3B

STONE DESIGN

East Breakwater - Head Section

$H_{max} = 8.7$ feet

$H_o = 12.1$ feet (10 year wave, winter season, ϕ_2)

$T = 7.8$ seconds

$d_s = 11.2$ feet (20 year, winter water level)

$K_R = 0.89$ $\qquad m = 0.01$

The method outlined in Section 7.121 of the Shore Protection Manual will be used to check if H_{max} is a breaking wave.

$$H_o' = H_o K_R = 12.1(0.89) = 10.8 \text{ feet}$$

$$\frac{H_o'}{gT^2} = \frac{10.8}{(32.2)(7.8)^2} = 0.0055$$

$$\frac{H_b}{H_o'} = 1.06 \quad \text{(from Fig. 7-3 of SPM)}$$

$$H_b = 1.06(H_o') = 1.06(10.8) = 11.4 \text{ feet}$$

$$\frac{H_b}{gT^2} = \frac{11.4}{(32.2)(7.8)^2} = 0.0058$$

$$\left.\begin{array}{l}\alpha = 1.53 \\ \beta = 1.22\end{array}\right\rangle \text{(from Fig 7-2 of SPM)}$$

$$(d_b)_{max} = \alpha H_b = 1.53(11.4) = 17.4 \text{ feet}$$

$$(d_b)_{min} = \beta H_b = 1.22(11.4) = 13.9 \text{ feet}$$

Since d_s is less than $(d_b)_{min}$, the deep water significant wave will have broken and reformed before reaching the east breakwater, therefore the H_{max} 8.7 feet will be assumed to be a breaking wave.

R. Gorecki DATE 9/29/80 SUBJECT Geneva, OH - Small Boat Harbor - PLAN 3B SHEET NO. 2 OF
CKD. BY KB DATE 10/1/80 JOB NO.

$$W = \frac{(155)(8.7)^5}{(2.5)(2.48-1)^3(2.0)} = 6297 \text{ lbs}$$

Armor Stone

$W_{max} = 2.0\,W = (2)(6297) = 12594 \text{ lbs} = 6.3 \text{ Tons}$

$W_{min} = 0.9\,W = (.9)(6297) = 5667 \text{ lbs} = 2.8 \text{ Tons}$

Use 3.0 Ton to 6.5 ton stone

$r = (2)(1.15)\left(\frac{6297}{155}\right)^{1/3} = 7.9$ feet

Underlayer Stone

$W_{1_{max}} = 0.2\,W = (0.2)(6297) = 1259 \text{ lbs}$

$W_{1_{min}} = 0.06 - (0.06)(6297) = 378 \text{ lbs}$

Use 400 lb to 1300 lb stone

$r = (2)(1.15)\left(\frac{0.1\,W}{155}\right)^{1/3} = 3.7$ feet

Bedding Stone

$W_{2_{max}} = 0.01\,W = (0.01)(6297) = 63 \text{ lbs}$

$W_{2_{min}} = 0.00015\,W = (0.00015)(6297) = 1 \text{ lb}$

Use a 2.0 foot layer of 1 lb to 60 lb bedding stone under the head section

Crest Width

$B = (3)(1.15)\left(\frac{6297}{155}\right)^{1/3} = 11.9$ feet

Use 12.0 feet

East Breakwater - Trunk Section

$H_{max} = 5.5$ feet

$H_0 = 11.5$ feet (10 year wave, full season, $\measuredangle_2$)

$T = 7.6$ seconds

BY K. Garecki DATE 9/24/80 SUBJECT Geneva, OH - Small Boat Harbor - PLAN 3B SHEET NO. 3 OF

CHKD. BY JB DATE 10/1/80 JOB NO.

$d_s = 6.4$ feet (20 Year, fall water level)

$K_R = 0.89$ $m = 0.01$

Based on the calculation to verify the breaking wave condition which was presented for the east breakwater head section, it will be assumed that $H_{max} = 5.5$ feet will be a breaking wave.

$$W = \frac{(155)(5.5)^3}{(3.5)(2.48-1)^3(2.0)} = 1136 \text{ lbs}$$

Armor Stone

$W_{max} = 2.0W = (2)(1136) = 2272$ lbs $= 1.2$ Tons

$W_{min} = 0.9W = (.9)(1136) = 1022$ lbs $= 0.5$ Ton

Use 0.5 Ton to 1.5 Ton stone

$r = (2)(1.15)\left(\frac{1136}{155}\right)^{1/3} = 4.5$ feet

Underlayer Stone

$W_{1max} = 0.2W = (0.2)(1136) = 227$ lbs

$W_{1min} = 0.06W = (0.06)(1136) = 68$ lbs

Use 70 lbs to 250 lb stone

$r = (2)(1.15)\left(\frac{0.1W}{155}\right)^{1/3} = 2.1$ feet

Bedding Stone

$W_{2max} = 0.01W = (0.01)(1136) = 11$ lbs

$W_{2min} = 0.00015W = (0.00015)(1136) = 0.2$ lbs

Use a 2.0 foot layer of bedding stone under the entire trunk section

Crest Width

$B = (3)(1.15)\left(\frac{1136}{155}\right)^{1/3} = 6.7$ feet

Use 7.0 feet

West Breakwater-Head Section

$H_{max} = 11.6$ feet

$H_o = 12.1$ feet (10-year wave, winter season, #3)

$T = 9.0$ seconds

$d_s = 15.7$ feet (20 year, winter water level)

$k_R = 0.70$ $m = 0.01$

The method outlined in Section 7.121 of the Shore Protection Manual will be used to check if H_{max} is a breaking wave.

$H_o' = H_o k_R = (12.1)(.7) = 8.5$ feet

$$\frac{H_o'}{gT^2} = \frac{8.5}{(32.2)(9)^2} = 0.0033$$

$$\frac{H_b}{H_o'} = 1.18 \quad \text{(from Fig 7-3 of SPM)}$$

$$H_b = 1.18\, H_o' = 1.18(8.5) = 10.0 \text{ feet}$$

$$\frac{H_b}{gT^2} = \frac{12.0}{(32.2)(9.0)^2} = 0.0038$$

$\alpha = 1.52$
$\beta = 1.20$ (from Fig 7-2 of SPM)

$(d_b)_{max} = \alpha H_b = (1.52)(10) = 15.2$ feet

$(d_b)_{min} = \alpha H_b = (1.2)(10) = 12.0$ feet

Since $d_s = 15.7$ feet is very near the range where the significant deepwater wave will break (ie. $(d_b)_{max} = 15.2$ feet), assume $H_{max} = 11.6$ feet is a breaking wave.

$$W = \frac{(155)(11.6)^3}{(2.5)(2.48-1)^3(2.0)} = 14926 \text{ lbs}$$

Armor Stone

$W_{max} = 2.0W = (2)(14926) = 29852 \text{ lbs} = 14.9 \text{ Tons}$

$W_{min} = 0.9W = (.9)(14926) = 13433 \text{ lbs} = 6.7 \text{ Tons}$

Use 6.5 Ton to 15.0 Ton stone

$r = (2)(1.15)\left(\frac{14926}{155}\right)^{1/3} = 10.5$ feet

Underlayer Stone

$W_{1_{max}} = 0.2W = (0.2)(14926) = 2985 \text{ lb} = 1.5 \text{ Tons}$

$W_{1_{min}} = 0.06W = (0.06)(14926) = 896 \text{ lb} = 0.5 \text{ Ton}$

Use 0.5 Ton to 1.5 Ton stone

$r = (2)(1.15)\left(\frac{0.1W}{155}\right)^{1/3} = 4.9$ feet

Bedding Stone

$W_{2_{max}} = 0.01W = (0.01)(14926) = 149 \text{ lbs}$

$W_{2_{min}} = 0.00015W = (0.00015)(14926) = 2.2 \text{ lbs}$

Use a 3.0 foot layer of 2 lb to 150 lb bedding stone under the head section,

Crest Width

$B = (3)(1.15)\left(\frac{14926}{155}\right)^{1/3} = 15.8$ feet

Use 16.0 feet

BY R. Gonecki DATE 9/30 SUBJECT Geneva, OH - Small Boat Harbor - PLAN 3B SHEET NO. 6 OF
CHKD. BY DB DATE 10/1/80 JOB NO.

West Breakwater - Trunk Section

$H_{max} = 7.5$ feet

$H_o = 11.5$ feet (10-year wave, fall season, #3)

$T = 8.8$ seconds

$d_s = 9.4$ feet (20-year, fall lake level)

$K_R = 0.70$ $m = 0.01$

The method outlined in Section 7.121 of the Shore Protection Manual will be used to check if H_{max} is a breaking wave.

$H_o' = K_R H_o = (0.7)(11.5) = 8.1$ feet

$$\frac{H_o'}{gT^2} = \frac{8.1}{(32.2)(8.8)^2} = 0.0033$$

$$\frac{H_b}{H_o'} = 1.18 \quad \text{(from Fig 7-3 of SPM)}$$

$H_b = 1.18\,(H_o') = (1.18)(8.1) = 9.6$ feet

$$\frac{H_b}{gT^2} = \frac{9.6}{(32.2)(8.8)^2} = 0.0038$$

$\alpha = 1.52$

$\beta = 1.20$

$(d_b)_{max} = \alpha H_b = 1.51(9.6) = 14.6$ feet

$(d_b)_{min} = \beta H_b = 1.20(9.6) = 11.5$ feet

Since d_s is less than $(d_b)_{min}$, the deep water significant wave will have broken and reformed before reaching the west breakwater, therefore the $H_{max} = 7.5$ feet will be assumed to be a breaking wave.

$$W = \frac{(155)(7.5)^3}{(3.5)(2.48-1)^3(2.0)} = 2882 \text{ lbs}$$

Armor Stone

$W_{max} = (2.0)(2882) = 5764$ lbs $= 2.9$ Tons

$W_{min} = (0.9)(2882) = 2594$ lbs $= 1.3$ Tons

Use 1.5 Ton to 3.0 Ton stone

$r = (2)(1.15)\left(\frac{2882}{155}\right)^{1/3} = 6.1$ feet

Underlayer Stone

$W_{1max} = 0.2W = (0.2)(2882) = 576$ lbs

$W_{1min} = 0.06W = (0.06)(2882) = 173$ lbs

Use 200 lb to 600 lb. stone

$r = (2)(1.15)\left(\frac{0.1W}{155}\right)^{1/3} = 2.8$ feet

Bedding Stone

$W_{2max} = 0.01W = (.01)(2882) = 28.8$ lbs

$W_{2min} = 0.00015W = (.00015)(2882) = 0.4$ lbs

Use a 2.0 foot layer of 0.5 lb to 30 lb bedding stone under entire trunk section.

Crest Width

$B = (3)(1.15)\left(\frac{2882}{155}\right)^{1/3} = 9.1$ feet

Use 9.0 feet.

PLAN 3B

CREST HEIGHT

East Breakwater - Head Section

$H_o = 12.1$ feet (20 year wave, Fall season, $\measuredangle_2$)

$T = 7.8$ seconds $\quad \cot\theta = 2.0$

$K_R = .89$ $\quad d_s = 11.0$ feet (10 year water level full season)

$H_{sig} = 7.0$ feet

$H_o' = K_R H_o = (.89)(12.1) = 10.8$ feet

$$\frac{H_o'}{gT^2} = \frac{10.8}{(32.2)(7.8)^2} = 0.0055$$

$$\frac{d_s}{H_o'} = \frac{11.0}{10.8} = 1.02$$

$\frac{d_s}{H_o'} = 0.80 \qquad \frac{R}{H_o'} = 2.34$ (from Fig 7-10 of SPM)

$\frac{d_s}{H_o'} = 1.02 \qquad \frac{R}{H_o'} = 2.35$ (Interpolated Value)

$\frac{d_s}{H_o'} = 2.0 \qquad \frac{R}{H_o'} = 2.42$ (from Fig 7-11 of SPM)

$R = 2.35(H_o') = 2.35(10.8) = 25.3$ feet

$k = 1.19$ (from Fig 7-13 of SPM)

$R_{smooth} = kR = (1.19)(25.3) = 30.1$ feet

From CETA 79-1, APPENDIX D, the runup ratio for smooth to rough slopes for $d_s/H_o' < 3$ and $\cot\theta = 2.0$ is $r = 0.44$

$R_{rough} = r\,R_{smooth} = (0.44)(30.1) = 13.2$ feet

This runup is overestimated due to the fact that Fig 7-8 through 7-12 and 7-14 through 7-18 of SPM are from Tests with 1:10 slope whereas the actual

beach slope is less in most cases. To remedy this discrepency, we use Goda's charts to calculate the wave heights at the structure for the 1:10 lake bed slope and for the actual beach slope at 1:100. The H_{sig}/H_o' for the design slope of 1:100 was computed using the GODA2 computer program.

<u>Goda Correction</u>

1:100 slope

$$\left(\frac{H_{sig}}{H_o'}\right)_{1:100} = \frac{7.0}{10.8} = 0.65$$

1:10 slope

$$\frac{d}{H_o'} = \frac{11}{10.8} = 1.02$$

$$\frac{H_o'}{L_o} = \frac{10.8}{(5.12)(7.8)^2} = 0.035$$

for $\frac{H_o'}{L_o} = 0.04$; $\frac{H_{sig}}{H_o'} = 0.94$

$\frac{H_o'}{L_o} = 0.035$; $\frac{H_{sig}}{H_o'} = 0.96$

for $\frac{H_o'}{L_o} = 0.02$; $\frac{H_{sig}}{H_o'} = 1.03$

$$\frac{\left(\frac{H_{sig}}{H_o'}\right)_{1:100}}{\left(\frac{H_{sig}}{H_o'}\right)_{1:10}} = \frac{0.65}{0.96} = 0.68$$

Actual runup = (0.68)(13.2) = 9.0 feet

The Cross & Sollitt Method is used to compute the required crest elevation which will yield a maximum 3.0 ft. transmitted wave in the entrance channel.

$$K_T = 0.54\left(1.04 - \frac{H_{bi}}{R}\right) = H_t/H_i$$

$$H_{bi} = R\left(1.04 - \frac{H_t}{0.54(H_i)}\right)$$

$$H_{bi} = (9.0)\left(1.04 - \frac{3.0}{(0.54)(7.0)}\right) = 2.2 \text{ feet}$$

Crest height = design water level + H_{bi} = 572.6 + 2.2 = 574.8

∴ A crest elevation of 574.8 (+6.2) is required to meet the criteria of a 3.0 foot transmitted wave in the entrance channel.

BY R. Gorecki DATE 10/1/80 SUBJECT Geneva, OH - Small Boat Harbor - PLAN 3B SHEET NO. 3 OF

CHKD. BY [illegible] DATE 10.1 JOB NO.

East Breakwater - Trunk Section

$H_0 = 12.1$ feet (20 Year wave, Full season, $\measuredangle_2$)

$T = 7.8$ seconds

$K_R = 0.89$

$H_{sig} = 4.2$ feet

$\cot\theta = 2.0$

$d_s = 6.0$ feet (10 year water level full season)

$H_0' = K_R H_0 = (0.89)(12.1) = 10.8$ feet

$$\frac{H_0'}{gT^2} = \frac{10.8}{(32.2)(7.8)^2} = 0.0055$$

$$\frac{d_s}{H_0'} = \frac{6.0}{10.8} = 0.56$$

$\frac{d_s}{H_0'} = 0.45$ $\frac{R}{H_0'} = 1.55$ (from Fig 7-9 of SPM)

$\frac{d_s}{H_0'} = 0.56$ $\frac{R}{H_0'} = 1.80$ (Interpolated Value)

$\frac{d_s}{H_0'} = 0.80$ $\frac{R}{H_0'} = 2.34$ (from Fig 7-10 of SPM)

$R = 1.80(H_0') = (1.80)(10.8) = 19.4$ feet

$k = 1.19$ (from Fig 7-13 of SPM)

$R_{smooth} = kR = (1.19)(19.4) = 23.1$ feet

From CETA 79-1, APPENDIX D, the runup ratio for smooth to rough slopes for $d_s/H_0' < 3$ and $\cot\theta = 2.0$ is $r = 0.44$

$R_{rough} = r\,R_{smooth} = (0.44)(23.1) = 10.2$ feet

This runup is overestimated due to the fact that Fig 7-8 through 7-12 and 7-14 through 7-18 of SPM are from tests with 1:10 slope whereas the actual beach slope is less in most cases. To remedy this

discrepency, we use Goda's Charts to calculate the wave heights at the structure for the 1:10 lake bed slope and for the actual beach slope of 1:100. The H_{sig}/H_0' for the design slope of 1:100 was compiled using the GODA 2 computer program.

Goda Correction

1:100 slope

$$\left(\frac{H_{sig}}{H_0'}\right)_{1:100} = \frac{4.2}{10.8} - 0.39$$

$$\frac{\left(\frac{H_{sig}}{H_0'}\right)_{1:100}}{\left(\frac{H_{sig}}{H_0'}\right)_{1:10}} = \frac{0.39}{0.63} - 0.62$$

1:10 slope

$$\frac{d}{H_0'} = \frac{6.0}{10.8} - 0.56$$

$$\frac{H_0'}{L_0} = \frac{10.0}{(5.12)(7.8)^2} = 0.035$$

for $\frac{H_0'}{L_0} = 0.04$; $\frac{H_{sig}}{H_0'} = 0.61$

$\frac{H_0'}{L_0} - 0.035$; $\frac{H_{sig}}{H_0'} = 0.63$

for $\frac{H_0'}{L_0} = 0.02$; $\frac{H_{sig}}{H_0'} = 0.70$

Actual runup = (0.62)(10.2) = 6.3 feet

The Cross & Sollitt Method is used to compute the required crest elevation which will yield a maximum 3.0 foot transmitted wave in the entrance channel. The layer thickness of the stone used for this section of the east breakwater require a crest elevation of 575.2, therefore the Cross & Sollitt Method will be used to check the transmitted wave.

$$k_T = 0.54\left(1.04 - \frac{H_{bc}}{R}\right) = \frac{H_T}{H_i} \qquad H_{bc} = 575.2 - 572.6 = 2.6 \text{ ft}$$

$$H_T = 0.54\left(1.04 - \frac{2.6}{6.3}\right)(4.2) = 1.42 \text{ ft.}$$

Since $H_T = 1.4$ feet < 3.0, the cross section meets the criteria for the transmitted wave height

BY R. Gorecki DATE 10/1/80 SUBJECT Geneva, OH. - Small Boat Harbor - PLAN 3B SHEET NO. 5 OF
CHKD. BY [illegible] DATE 9 Oct JOB NO.

West Breakwater - Head Section

H_o = 12.1 feet (20 year wave, fall season, #2)

T = 7.8 seconds

K_R = 0.90

H_{sig} = 9.0 feet

cot θ 2.0

d_s = 15.5 feet (10 year water level, fall season)

$H_o' = K_R H_o = (0.9)(12.1) = 10.9$ feet

$$\frac{H_o'}{gT^2} = \frac{10.9}{(32.2)(7.8)^2} = 0.0056$$

$$\frac{d_s}{H_o'} = \frac{15.5}{10.9} = 1.42$$

$\frac{d_s}{H_o'} = 0.80$ $\frac{R}{H_o'} = 2.31$ (from Fig 7-10 of SPM)

$\frac{d_s}{H_o'} = 1.42$ $\frac{R}{H_o'} = 2.36$ (Interpolated Value)

$\frac{d_s}{H_o'} = 2.0$ $\frac{R}{H_o'} = 2.40$ (from Fig 7-11 of SPM)

$R = 2.40(H_o') = (2.36)(10.9) = 25.7$ feet

k = 1.19 (from Fig 7-13 of SPM)

$R_{smooth} = kR = (1.19)(25.7) = 30.6$ feet

From CETA 79-1, APPENDIX D, the runup ratio for smooth to rough slopes for $d_s/H_o' < 3$ and cot θ = 2.0 is r = 0.44

$R_{rough} = r R_{smooth} = 0.44(30.6) = 13.5$ feet

This runup is overestimated due to the fact that Fig 7-8 through 7-12 and 7-14 through 7-18 of SPM are from tests with 1:10 slope whereas the actual beach slope is less in most cases. To remedy this discrepency, we use Goda's charts to calculate

the wave heights at the structure for the 1:10 lake bed slope and for the actual beach slope of 1:100. The H_{sig}/H_o' for the design slope of 1:100 was computed using the GODA 2 computer program.

Goda Correction

1:100 slope

$$\left(\frac{H_{sig}}{H_o'}\right)_{1:100} = \frac{4.0}{10.9} = 0.83$$

1:10 slope

$$\frac{d}{H_o'} \quad \frac{15.5}{10.9} = 1.42$$

$$\frac{H_o'}{L_o} = \frac{10.9}{(5.12)(7.8)^2} = 0.035$$

for $\frac{H_o'}{L_o} = 0.04$ $\quad \frac{H_{sig}}{H_o'} = 1.05$

$\frac{H_o'}{L_o} = 0.035$ $\quad \frac{H_{sig}}{H_o'} = 1.10$

for $\frac{H_o'}{L_o} = 0.02$ $\quad \frac{H_{sig}}{H_o'} = 1.25$

$$\frac{\left(\frac{H_{sig}}{H_o'}\right)_{1:100}}{\left(\frac{H_{sig}}{H_o'}\right)_{1:10}} = \frac{0.83}{1.10} = 0.75$$

Actual Runup $= (0.75)(13.5) = 10.1$ feet

The Cross & Sollitt Method is used to compute the required crest elevation which will yield a maximum 3.0 foot transmitted wave in the entrance channel.

$$K_T = 0.54\left(1.04 - \frac{H_{bi}}{R}\right) = \frac{H_T}{H_i}$$

$$H_{bi} = R\left(1.04 - \frac{H_t}{(0.54)(H_i)}\right)$$

$$H_{bi} = (10.1)\left(1.04 - \frac{3.0}{(0.54)(9.0)}\right) = 4.3 \text{ feet}$$

Crest Height = design water level + H_{bi} = 572.6 + 4.3 = 576.9

∴ A crest elevation of 576.9 (+8.3) is required to meet the criteria of a 3.0 foot transmitted wave in the entrance channel.

BY R. Gorecki DATE 10/1/80 SUBJECT Geneva, OH - Small Boat Harbor - PLAN 3B SHEET NO. 7 OF
CHKD. BY [illegible] DATE 8 Oct JOB NO.

West Breakwater - Trunk Section

$H_0 = 12.1$ feet (20 year wave, fall season, $\measuredangle_2$

$T = 7.8$ seconds

$k_R = 0.89$

$H_{sig} = 5.7$ feet

$\cot\theta = 2.0$

$d_s = 9.0$ feet (10 year water level, full season)

$H_0' = k_R H_0 = (0.89)(12.1) = 10.8$ feet

$$\frac{H_0'}{gT^2} = \frac{10.8}{(32.2)(7.8)^2} = 0.0055$$

$$\frac{d_s}{H_0'} = \frac{9.0}{10.8} = 0.83$$

for $\frac{d_s}{H_0'} = 0.80$, $\frac{R}{H_0'} = 2.34$ (from Fig 7-10 of SPM)

$\therefore$ for $\frac{d_s}{H_0'} = 0.83$; $\frac{R}{H_0'} \approx 2.34$

$R = 2.34(H_0') = (2.34)(10.8) = 25.3$ feet

$k = 1.19$ (from Fig 7-13 of SPM)

$R_{smooth} = kR = (1.19)(25.3) = 30.1$ feet

From CETA 79-1, APPENDIX D, the runup ratio for smooth to rough slopes for $d_s/H_0' < 3$ and $\cot\theta = 2.0$ is $r = 0.44$

$R_{rough} = r\,R_{smooth} = (0.44)(30.1) = 13.2$ feet

This runup is overestimated due to the fact that Fig 7-8 through 7-12 and 7-14 through 7-18 of SPM are from tests with 1:10 slope whereas the actual beach slope is less in most cases. To remedy the discrepancy, we use Goda's charts to calculate the wave heights at the structure for the 1:10

lake bed slope and for the actual beach slope of 1:100. The H_{sig}/H_o' for the design slope of 1:100 was computed using the GODA 2 computer program.

<u>Goda correction</u>

1:100 slope

$$\left(\frac{H_{sig}}{H_o'}\right)_{1:100} = \frac{5.7}{10.8} = 0.53$$

$$\frac{\left(\frac{H_{sig}}{H_o'}\right)_{1:100}}{\left(\frac{H_{sig}}{H_o'}\right)_{1:10}} = \frac{0.53}{0.86} = 0.62$$

1:10

$$\frac{d}{H_o'} = \frac{9}{10.8} = 0.83$$

$$\frac{H_o'}{L_o} = \frac{10.8}{(5.12)(7.8)^2} = 0.035$$

for $\frac{H_o'}{L_o} = 0.04$; $\frac{H_{sig}}{H_o'} = 0.84$

$\frac{H_o'}{L_o} = 0.035$; $\frac{H_{sig}}{H_o'} = 0.86$

for $\frac{H_o'}{L_o} = 0.02$; $\frac{H_{sig}}{H_o'} = 0.91$

Actual runup = (0.62)(13.2) = 8.2 feet

The Cross & Sollitt Method is used to compute the required crest elevation which will yield a maximum 3.0 foot transmitted wave in the entrance channel. The layer thicknesses of the stone used for this section of the west breakwater require a crest elevation of 574.5, therefore the Cross & Sollitt Method will be used to check the transmitted wave:

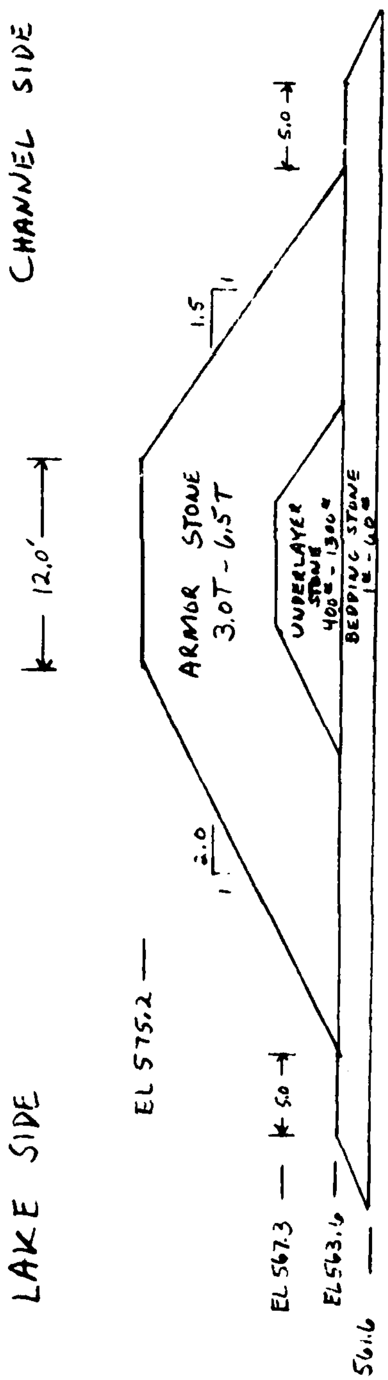
$$K_T = 0.54\left(1.04 - \frac{H_{bc}}{R}\right) = \frac{H_t}{H_i} \ ; \ H_{bc} = 574.5 - 572.6 = 1.9 \text{ feet}$$

$$H_t = (0.54)\left(1.04 - \frac{1.9}{8.2}\right)(5.7) = 2.5 \text{ feet}$$

Since $H_t = 2.5$ feet < 3.0, the cross section meets the criteria for the transmitted wave height

BY R Gorecki DATE 10/4/84 SUBJECT Geneva, OH - Small Boat Harbor - PLAN 7B SHEET NO. .... OF ....

CHKD. BY .... DATE .... JOB NO. ....



EAST BREAKWATER

HEAD SECTION

Scale: 1" = 10.0'

Figure B-6

BY R.Garecki DATE 10/1/80 SUBJECT Geneva, OH - Small Boat Harbor - PLAN 3B SHEET NO. .... OF ....
CHKD. BY JP DATE 8 Oct 1 JOB NO. ....

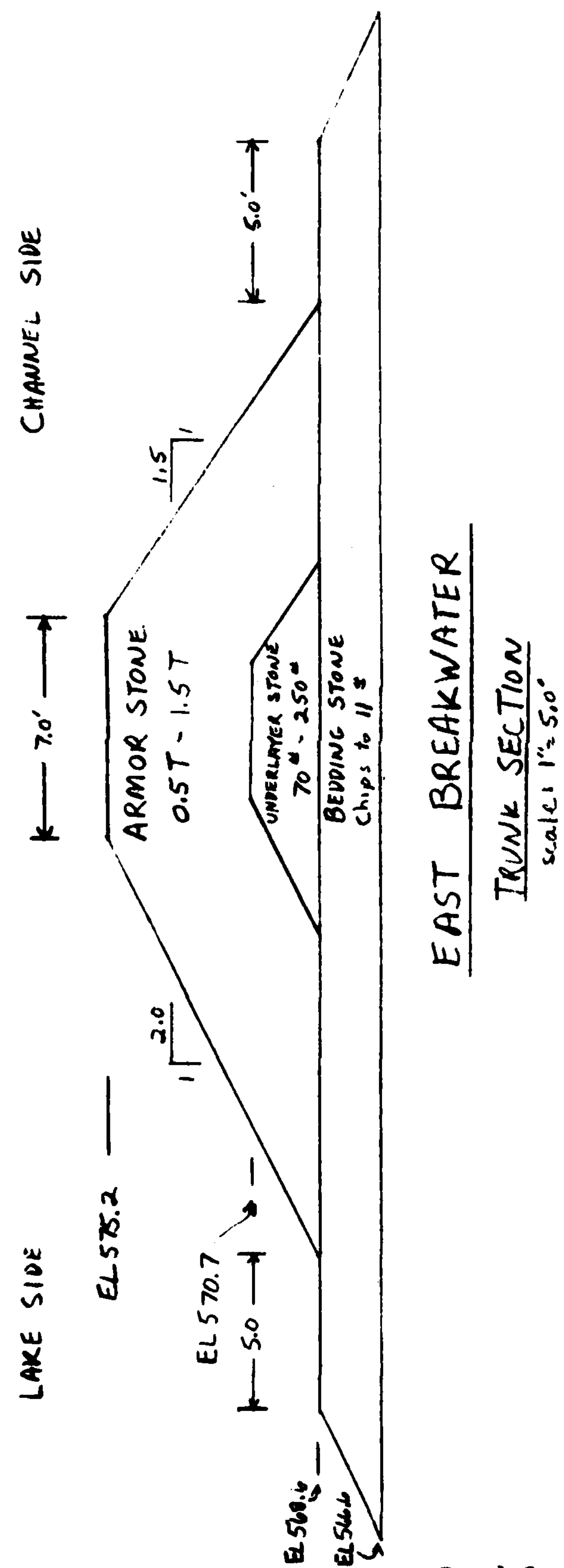


Figure B-1

BY R. Gorecki DATE 10/6/86 SUBJECT Geneva, OH - Small Boat Harbor - PLAN 3B SHEET NO. .... OF ....

CHKD. BY JP DATE 8 Oct. JOB NO. ....

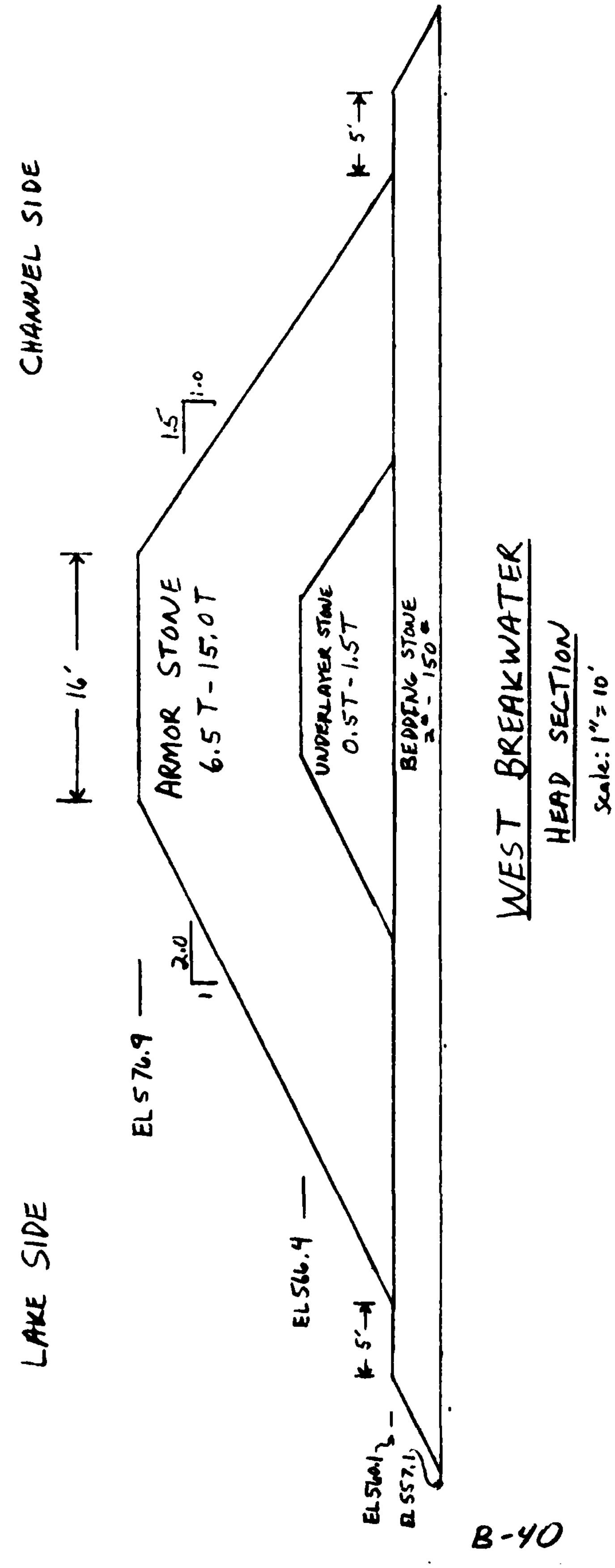


Figure B-8

APPENDIX B1

HYDROLOGY AND HYDRAULIC DESIGN

GENEVA-ON-THE-LAKE SMALL-BOAT HARBOR

FINAL REFORMULATION PHASE I GENERAL DESIGN MEMORANDUM

U. S. Army Engineer District, Buffalo
1776 Niagara Street
Buffalo, NY 14207

GENEVA-ON-THE-LAKE, OHIO
FINAL PHASE I REFORMULATION
GENERAL DESIGN MEMORANDUM

APPENDIX B1
HYDROLOGY AND HYDRAULIC DESIGN

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B1-1 INTRODUCTION

The plan selected for additional detailed study includes a water control structure at the outlet of an existing wetland area. The purpose of the structure, described in detail in the Main Report, is to allow for managing of water levels in the wetland. This structurc, as shown on Plate 16 in Appendix H, includes a stop log structure with a 5.0 foot opening and a sill elevation at +3.0 feet (LWD) and a 120-foot long overflow section with a crest elevation at +6.0 feet (LWD).

B1-2 STOP LOG STRUCTURE HYDRAULIC DESIGN

The 5.0 foot width of the stop log opening was selected such that the water levels in the wetland area could be lowered gradually from +6.0 to +3.0 feet (LWD) in about 1 week's time. Based upon USGS topographic data and detailed topography from field surveys, there is approximately 10.5 acre-feet of storage between these levels. This is the maximum amount that would have to be drained. The constant discharge rate needed to release 10.5 acre-feet of storage in one day is about 5.0 cfs. The instantaneous discharge capacity of the stop log structure with all logs removed would be about 65 cfs. This is based on $Q = CLH^{3/2}$ where Q is discharge in cfs, L is length in feet, H is the head in feet over the crest and C is a weir coefficient with, for this case, C = 2.5, L = 5.0 feet, and H = 3.0 feet. Even considering the fact that the 65 cfs capability is instantaneous and that the actual discharge will decrease as the water level in the wetland recedes, the 5.0 foot width is considered adequate to allow for complete draining of the wetland within one weeks time. In addition, under normal circumstances, the level of Lake Erie is above +3.0 (LWD) which further enhances the capability of lowering water levels within the presribed time limit as the difference in water levels between the lake and the wetland area would be less than 3.0 feet.

B1-3 OVERFLOW SECTION HYDRAULIC DESIGN

The 120 foot long overflow section, with a crest elevation of +6.0 (LWD), was sized to pass the 1.0 percent chance flood. This was considered reasonable based upon guidance contained in EC 1110-2-27 titled "Policies and Procedures Pertaining to Determination of Spilling Capacities and Freeboard Allowances for Dams." Standard 4 is considered appropriate in that the water control structure is low in height with minimal storage and there are no downstream damage areas. Based on these factors, it was considered appropriate to design the overflow section to insure its structural security for the 1.0 percent chance flood.

B1-4 The 1.0 percent chance flood was estimated to be 800 cfs from a regression equation contained in the USGS Water Resources Investigations, 79-83 titled "Techniques for Estimating Magnitude and Frequency of Floods on Rural Unregulated Streams in New York State Excluding Long Island." The equation for the 1.0 percent chance flood is:

$$\log Q_{100} = 4.70 + 0.733 \log A - 2.03 \log (St + 10)$$

where A is the drainage area in square miles and St is the watershed storage index. The unnamed tributary to the wetland has a drainage area of

2.53 square miles. The St for the watershed was determined to be 0.72 based upon USGS quad maps and techniques presented in the above mentioned publication.

B1-5 Based on this discharge, the length of spillway was determined from the equation:

$$Q = CLH^{3/2}$$

B1-6 Using a conservative value of 2.5 for C and the existing topography at the proposed site, it was found that a 120 foot long crest length would be sufficient to pass the 800 cfs at a head of about 1.9 feet. This would allow for tying both ends of the structure into high ground at +8.0 (LWD) at each end. The crest and downstream face of the overflow section will be provided with riprap or other protection from velocities ranging between 7 and 8 ft/sec.

APPENDIX C

COST ESTIMATES

GENEVA-ON-THE-LAKE SMALL-BOAT HARBOR

FINAL REFORMULATION PHASE I GENERAL DESIGN MEMORANDUM

U. S. Army Engineer District, Buffalo
1776 Niagara Street
Buffalo, NY 14207

GENEVA-ON-THE-LAKE, OHIO
FINAL PHASE I REFORMULATION
GENERAL DESIGN MEMORANDUM

APPENDIX C
COST ESTIMATES

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APPENDIX C
COST ESTIMATES

C1. PURPOSE

This appendix presents the estimate of cost and related cost comparisons for the alternatives considered in formulating a selected plan of improvement at Geneva-on-the-Lake, OH.

C2. COST DATA

The cost data for Alternatives 1, 2, 3, and 4 (as presented in the Stage 2 Document) were updated from May 1979 to October 1980 price levels by use of the Engineering News Record (ENR) Construction Cost Index. Unit prices for features in Alternative 3b were taken from similar items in other alternatives and new features included were estimated from similar construction jobs and updated to October 1980 price levels in Table 6. The estimate for Plan 3b is at August 1981 price levels in Table 6a in order to provide current costs.

C3. The project features entitled Engineering and Design and Supervision and Administration experienced cost changes based on increases in price levels, overhead rates, and the Pre-Construction Planning Estimate which increased due to added detail in the Phase I planning and design efforts.

C4. A contingency factor has been applied to the first cost of each construction feature to account for variations in material unit prices, quantities, the methods of construction, and material storage and disposal.

C5. TOPOGRAPHIC AND SUBSURFACE INFORMATION

Information available in the District Office to prepare the estimate consisted of soundings and topography over the entire area being considered for alternative plans 1, 2, 3, and 4. The subsurface information was obtained from a Seismic Study performed in August-September 1978, and the Soil Boring Program performed for the 1969 Interim Report.

C6. Alternative 3b, identified for additional detailed study, was estimated based on revised subsurface contours dated October 1980 and detailed topographic field surveys performed in 1979.

C7. CONSTRUCTION FEATURES

Alternatives considered in formulating a selected plan of improvement are described in detail in the main report. The principal items of work are channel dredging and breakwater construction.

C8. Rubblemound breakwaters for the alternatives were determined to be the best suited to minimize wave build-up and reflection. Size and quantity of stone are based upon design considerations discussed in Appendix B.

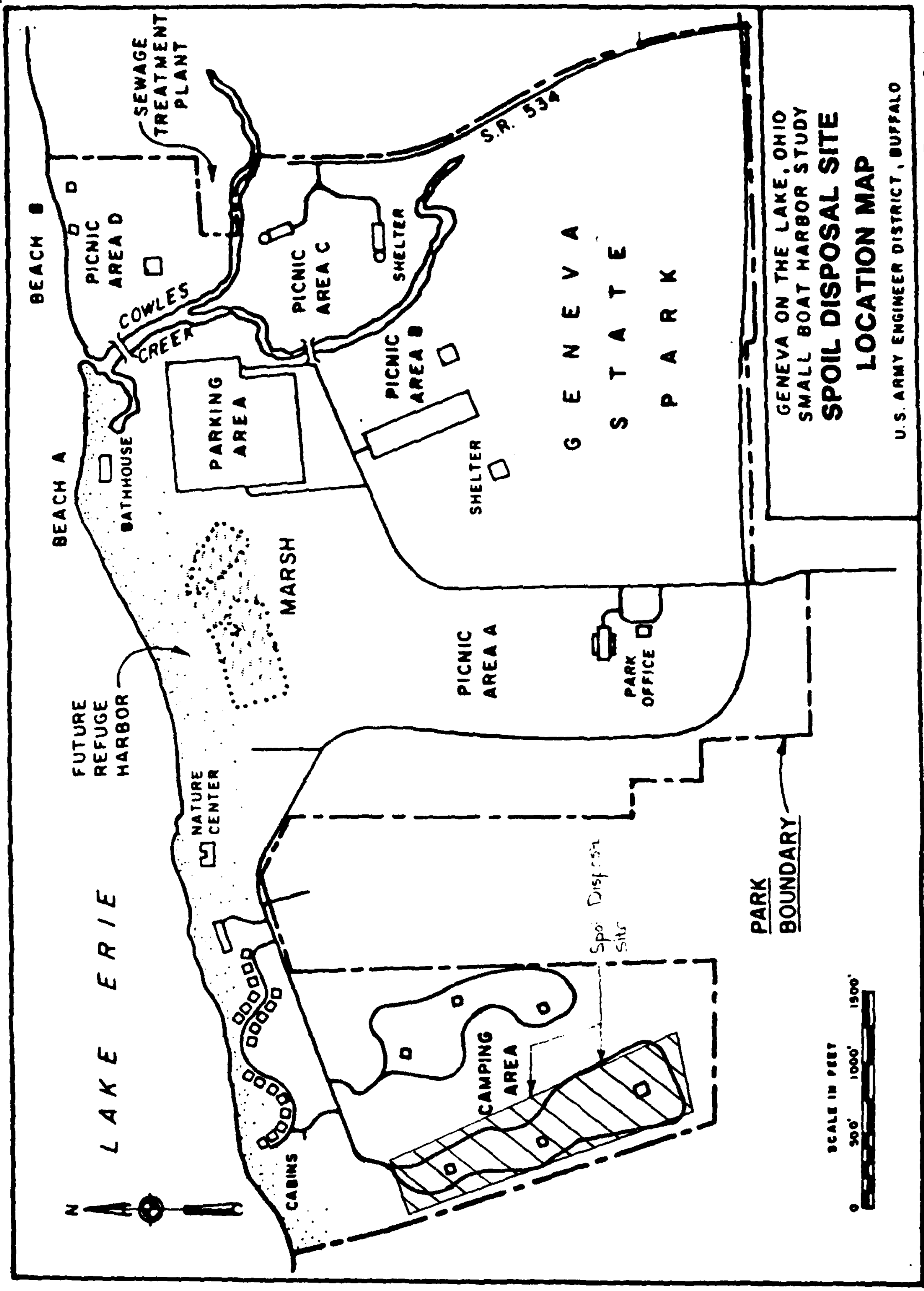
C9. The dredging quantities for the alternatives are based upon soundings in the areas to be dredged and the volume of material to be excavated was estimated from cross sections drawn based on the subsurface information obtained.

An overdepth of one foot and sideslopes of one vertical on three horizontal for earth (overburden) and till material and a vertical slope for rock have been used in determination of quantities. It was assumed that dredging (underwater excavation) would be performed by dragline for near shore material and a hydraulic dredge with an attendant plant for material further out into the lake. The excavation would be done in the dry by a self-propelled scraper with the material being hauled approximately one mile to be stockpiled. Any lake disposal site if needed would be fully coordinated with the USFWS, EPA, ODNR, and other affected interests as will the advisability of using the sandy cobble material for beach nourishment. The upland disposal site for any excavated material, as recommended by ODNR, is shown in Figure C1.

C10. The mitigation plan primarily involves the construction of a water control structure and wetland islands. The islands would be constructed by the hauling of material from the harbor site using self-propelled scrapers with a bulldozer assisting in hauling and material spreading, and the final grading being performed by a motor grader. The cost of the mitigation plan, including engineering and design and supervision and administration, is estimated at $310,000 (October 1980 price levels, $332,000, August 1981 price levels).

C11. ESTIMATE OF LANDS AND DAMAGES

Although all land required for the project is within Geneva State Park (classified as recreation land), and no actual out-of-pocket expense would be required, the economic value of the land must be charged against the project. Also involved in Alternatives No. 1, No. 3, and No. 3b is a substantial portion of a paved parking lot and access to a bathhouse built by the State of Ohio in 1968 at a cost in excess of $250,000. For estimating purposes this construction cost for the bathhouse was converted to October 1980 price levels, of approximately $694,000, using the Engineering News Record's Construction Cost Index ($752,000 on August 1981 price levels). A depreciation factor of 15 percent was applied for access restrictions to the bathhouse for Alternatives No. 1, No. 3, and No. 3b. Lakefront land along the southern shore of Lake Erie generally ranges from $100 to $500 per front foot and $1,500 to $4,000 per acre for upland. The estimate of the first cost of land and damages for the five alternatives is shown in Table C1.



GENEVA ON THE LAKE, OHIO
SMALL BOAT HARBOR STUDY
SPOIL DISPOSAL SITE
LOCATION MAP
U.S. ARMY ENGINEER DISTRICT, BUFFALO

FIGURE C-1

Table C1 - Estimate of Lands and Damages

Item	Quantity	Unit	Unit Cost 1/	Amount
			$	$
Alternative No. 1				
Lakefront	500	feet	150	75,000
Developed Recreation Land	14	acres	3,500	49,000
Depreciation to Bathhouse		L.S.		104,000
Improved Parking Lot 2/	400,000	S.F.	1	400,000
Total				628,000
Alternative No. 2				
Lakefront	1,200	feet	150	180,000
Partially Developed Recreation Land	7	acres	2,500	17,500
Total				197,500
				say 198,000
Alternative No. 3				
Lakefront	800	feet	150	120,000
Partially Developed Recreation Land	14	acres	3,000	42,000
Depreciation to Bathhouse		L.S.		104,000
Improved Parking Lot 2/	240,000	S.F.	1	240,000
Total				506,000
Alternative No. 3b				
Lakefront	800	feet	150	120,000
Partially Developed Recreation Land	15	acres	3,000	45,000
Depreciation to Bathhouse		L.S.		104,000
Improved Parking Lot 2/	215,000	S.F.	1	215,000
Total				484,000 3/
Alternative No. 4				
Lakefront	600	feet	150	90,000
Recreation Land	14	acres	2,500	35,000
Improved Parking Lot	10,000	S.F.	1	10,000
Total				135,000

1/ October 1980 price levels.

2/ Costs in addition to land costs for parking facilities.

3/ $493,000 on August 1981 price levels.

C12. ESTIMATE OF FIRST COST OF CONSTRUCTION AND ANNUAL OPERATION AND MAINTENANCE COST

The estimated first cost for the five alternatives considered in this Phase I study, based on October 1980 prices, are shown in Tables C2 through C6 inclusive. Table C6a presents the cost for Plan 3b on August 1981 price levels. Handrails are a necessary feature of recreational facilities for fishing from shore connected breakwaters and are also necessary for public safety. The harbor project can be constructed without recreation facilities but must include handrails. The cost for handrails shown would be added to the breakwater cost of the project if recreation facilities are not constructed.

C13. The annual operation and maintenance costs associated with each alternative is also shown in Tables C2 through C6a. These costs are based upon past experience for similar maintenance work done in the Buffalo District in maintaining harbor channels and breakwaters. The annual maintenance cost for maintaining the aids to navigation for Plans 1, 2, 3, and 4 were updated from the Interim Report by price level and were originally furnished by the Ninth Coast Guard District. The maintenance costs for aids to navigation for Plan 3b was supplied by the Ninth Coast Guard District by letter dated 21 August 1980 (Exhibit E-7 in Appendix E).

C14. ESTIMATE OF SELF-LIQUIDATING COSTS

The above cost estimates do not include the self-liquidating cost associated with each alternative for the mooring area, launching ramps and public service facilities estimated, on October 1980 price levels, at: 1) $4,800,000 for Alternative No. 1; 2) $4,140,000 for Alternative No. 2; 3) $4,780,000 for Alternative No. 3; 4) $5,920,000 for Alternative 3b ($6,340,000 on August 1981 price levels); and 5) $4,370,000 for Alternative No. 4. These self-liquidating facilities are the responsibility of the non-Federal sponsor, ODNR. In addition, because these facilities are considered self-liquidating they do not enter into the benefit-cost analysis as presented in Appendix D.

C15. ESTIMATE OF ANNUAL CHARGES

The estimated investment costs, project costs and annual charges for the five alternatives are presented in Tables C7 through C11, inclusive. Table C11a presents the same information for Plan 3b, updated to August 1981 price levels. It is assumed construction would require two years, therefore interest during construction has been included. The interest and amortization rates used are 7-3/8 percent in accordance with the Water Resources Council Regulation. The economic life of the project is assumed to be 50 years.

REASONABLE CONTRACT ESTIMATE TABLE C2					SHEET 1 OF 2
PROJECT Geneva-on-the-Lake, OH Small Boat Harbor Alternative No. 1 Project Costs (October 1980 P.L.)					INVITATION NO.
ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE	ESTIMATED AMOUNT
02.	Relocation				
	Footbridge Removal		LS	12,000	12,000
	Contingency				2,000
	Total				14,000
09.	Channels				
	Mob & Demob		LS		58,000
	Dredging	10,925	CY	9.50	103,788
	Excavation				
	Overburden	47,919	CY	4.00	191,676
	Till	35,466	CY	7.00	248,262
	Rock	6,096	CY	21.00	128,016
	Retaining Wall	1,035	LF	700.00	724,500
	Contingencies				295,758
					1,750,000
	Total				
10.	Breakwaters				
	Mob & Demob		LS		58,000
	Armor Stone 5-25 Tons	18,612	TN	35.00	651,420
	2-5 Tons	4,935	TN	37.00	182,595
	Underlayer 0.5-2.5 Tons	1,606	TN	30.00	48,180
	0.25-1.0 Tons	2,041	TN	32.00	65,312
	0.05-0.5 Tons	1,576	TN	33.50	52,796
	Bedding 1-250	8,802	TN	24.50	215,649
	Sand Bypass Pipe		LS		125,000
	Contingencies				285,048
					1,684,000
	Total				
14.	Recreational Facilities				
	Handrail	1,150	L.F.	12.00	13,800
	Walkway	510	CY	167.00	85,170
	Contingencies				20,030
					119,000
	Total				
30.	Engineering and Design		LS		845,000
31.	Supervision and Administration		LS		308,000
	Subtotal				4,720,000
	Aids to Navigation	2	EA	14,000	28,000
	Total				4,748,000

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REASONABLE CONTRACT ESTIMATE

SHEET 2 OF 2

PROJECT Geneva-on-the-Lake Alternative No. 1

INVITATION NO.

ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE	ESTIMATED AMOUNT
	Lands and Damages		LS		628,000
	Footbridge and Sidewalk		LS		117,000
	Contingencies				23000
	Total				140,000
	Total				5,516,000
	Annual Maintenance				
	Channels and Breakwaters				(44,500)
	Aids to Navigation				(1,000)
	Recreation				(5,800)
	Total				51,300
	Non-Federal Costs				3,128,000
	50% of Project Cost less Aids to Navigation				(2,360,000)
	Cash Contribution for Navigation				2,262,000
	Cash Contribution for Recreation				98,000
	Lands and Damages				(628,000)
	Footbridge and Facilities				(140,000)
	Federal Costs				2,388,000
	50% of Project Costs				(2,360,000)
	Aids to Navigation				(28,000)

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REASONABLE CONTRACT ESTIMATE TABLE C3 — SHEET 1 OF 2

PROJECT Geneva-on-the-Lake, OH Small Boat Harbor [illegible]
Alternative No 2 Project Cost [illegible]

INVITATION NO.

ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE	ESTIMATED AMOUNT
[illegible]	Channels				
	Mob & Demob		LS		58,000
	Dredging	1395	CY	9.50	13,253
	Excavation				
	Overburden	60918	CY	4.00	243,672
	Till	53553	CY	7.00	374,871
	Retaining Wall	100	LF	700.00	70,000
	Rip-Rap	3005	SY	43.50	130,718
	Contingencies				174,486
	Total				1,065,000
10.	Breakwaters				
	Mob & Demob		LS		58,000
	Armor Stone 5-25 Tons	2170	TN	35.00	75,950
	3.5-8 Tons	25,508	TN	36.00	918,288
	2-5 Tons	861	TN	37.00	31,857
	Underlayer 0.5-2.5 Tons	287	TN	30.00	8,610
	0.05-1.0 Tons	4,522	TN	32.00	144,704
	0.05-0.5 Tons	2,919	TN	33.50	97,787
	Bedding 1-250 lb.	14,413	TN	24.50	353,119
	Sand Bypass Pipe		LS		250,000
	Contingencies				380,685
	Total				2,319,000
14.	Recreational Facilites				
	Handrail	1,900	LF	12.00	22,800
	Walkway	850	CY	167.00	141,950
	Footbridge		LS		40,000
	Contingencies				43,250
	Total				257,000
30.	Engineering and Design		LS		846,000
31.	Supervision and Administration		LS		313,000
	Subtotal				4,800,000
	Aids to Navigation				
	U.S. Coast Guard	4	EA.	14,000	56,000
	Total				4,856,000

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REASONABLE CONTRACT ESTIMATE					SHEET 2 OF 2
PROJECT Geneva-on-the-Lake, OH Alternative No. 2					INVITATION NO.
ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE	ESTIMATED AMOUNT
	Lands and Damages		LS		198,000
	Total				5,054,000
	Annual Maintenance				
	Channels and Breakwaters				(39,900)
	Aids to Navigation				(2,000)
	Recreation				(9,500)
	Total				51,400
	Non-Federal Costs				2,598,000
	50% of Project Costs less				
	Aids to Navigation				(2,400,000)
	Cash Contribution for Navigation				2,190,000
	Cash Contribution for Recreation				210,000
	Lands and Damages				(198,000)
	Federal Costs				2,456,000
	50% of Project Costs				(2,400,000)
	Aids to Navigation				(56,000)

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REASONABLE CONTRACT ESTIMATE TABLE C4					SHEET 1 OF 2
PROJECT Geneva-on-the-Lake, OH Small Boat Harbor Alternative No. 3 Project Costs (October 1980 PL)					INVITATION NO.
ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE	ESTIMATED AMOUNT
04	Channels				
	Mob & Demob		LS		58,000
	Dredging	3,376	CY	9.50	32,072
	Excavation				
	Overburden	57,646	CY	4.00	230,584
	Till	45,495	CY	7.00	318,465
	Rock	2,400	CY	21.00	50,400
	Retaining Wall	565	L.F	700.00	395,500
	Rip-Rap	938	SY	43.50	40,803
	Contingencies				223,176
	Total				1,349,000
10.	Breakwaters				
	Mob & Demob		LS		58,000
	Armor Stone 5-25 Tons	11,116	TN	35.00	389,060
	2-5 Tons	5,028	TN	37.00	186,036
	Underlayer 0.5-2.5 Tons	2,317	TN	30.00	69,510
	0.05-0.5 Tons	971	TN	33.50	32,529
	Bedding 1-250 lb.	5,208	TN	24.50	127,596
	Sand Bypass Pipe		LS		125,000
	Contingencies				195,269
	Total				1,183,000
14.	Recreational Facilities				
	Handrail	1050	LF	12.00	12,600
	Walkway	465	CY	167.00	77,655
	Contingencies				17,745
	Total				108,000
30.	Engineering and Design		LS		885,000
31.	Supervision and Administration		LS		245,000
	Total Project Costs				3,720,000
	Aids to Navigation	2	EA	14,000	28,000
	Total				3,748,000
	Lands and Damages				506,000
	Total				4,254,000

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REASONABLE CONTRACT ESTIMATE

SHEET 2 OF 2

PROJECT Geneva
Alternative No. 3

INVITATION NO.

ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE	ESTIMATED AMOUNT
	Annual Maintenance				
	Channels and Breakwaters		LS		32,700
	Aids to Navigation		LS		1,000
	Recreation		LS		5,200
	Total				38,900
	Non-Federal Costs				
	50% of Project Costs less				2,366,000
	Aids to Navigation				(1,860,000)
	Cash Contribution for Navigation				1,766,000
	Cash Contribution for Recreation				94,000
	Lands and Damages				(506,000)
	Federal Costs				1,888,000
	50% of Project Costs				(1,860,000)
	Aids to Navigation				(28,000)

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REASONABLE CONTRACT ESTIMATE TAB-E C5

SHEET 1 OF 2

PROJECT Geneva-on-the-Lake, OH Small Boat Harbor
Alternative No. 4 Project Costs (Oct[illegible])

INVITATION NO.

ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE	ESTIMATED AMOUNT
09.	Channel				
	Mob & Demob		LS		58,000
	Dredging	7995	CY	9.50	75,481
	Excavation				
	Overburden	29,069	CY	4.00	116,276
	Till	46,419	CY	7.00	324,933
	Retaining Wall	260	LF	700	182,000
	Contingencies				152,310
	Total				910,000
10.	Breakwaters				
	Mob & Demob		LS		58,000
	Armor Stone 5-25 TONS	9051	TN	35.00	316,785
	3.5-8 TONS	3892	TN	36.00	140,112
	2.5-5.5 TONS	2120	TN	37.00	78,440
	Underlayer 0.5-2.5 tons	1722	TN	30.00	51,660
	0.2-0.8 TONS	756	TN		
	0.05-0.5 Tons	424	TN	33.50	14,204
	Bedding 1-250 lb	4515	TN	24.50	110,618
	Sand Bypass Pipe		LS		125,000
	Retaining Wall	220	LF	440.00	96,800
	Fill	6200	TN	5.00	31,000
	Contingincies				206,381
	Total				1,229,000
14.	Recreational Facilities				
	Handrail	900	LF	12.00	10,800
	Walkway	400	CY	167.00	66,800
	Contingencies				15,400
	Total				93,000
30	Engineering and Design		LS		831,000
31	Supervision and Administration		LS		217,000
	Subtotal				3,280,000
	Aids to Navigation	2	EA	14,000	28,000
	Total				3,308,000
	Lands and Damages				135,000
	Total				3,443,000

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REASONABLE CONTRACT ESTIMATE

SHEET 2 OF 2

PROJECT Geneva
Alternative No. 4

INVITATION NO.

ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE	ESTIMATED AMOUNT
	Annual Maintenance				
	Channels and Breakwaters				31,400
	Aids to Navigation				1,000
	Recreation				4,500
	Total				36,900
	Non-Federal Costs				1,775,000
	50% of Project Costs less				(1,640,000)
	Aids to Navigation				
	Cash Contribution for Navigation				1,550,000
	Cash Contribution for Recreation				90,000
	Lands and Damages				(135,000)
	Federal Costs				1,668,000
	50% of Project Costs				(1,640,000)
	Aids to Navigation				(28,000)

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REASONABLE CONTRACT ESTIMATE TABLE C-6					SHEET 1 OF 2
PROJECT Geneva-on-the-Lake, Small Boat Harbor Alternative 3b Project Costs (October 1980 PL)					INVITATION NO.
ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE	ESTIMATED AMOUNT
09	Channels				
	Mob & Demob	—	LS	58,000	58,000
	Dredging	4,000	CY	9.50	38,000
	Excavation				
	Overburden	78,000	CY	4.00	312,000
	Till	73,000	CY	7.00	511,000
	Rock	18,000	CY	21.00	378,000
	Rip-rap slope - Stone	8500	SY	43.50	369,750
	Backfill	5500	CY	2.00	11,000
	Landscaping	—	LS	34,000	34,000
	Diaphram Cell Wall - Concrete	1,600	CY	167.00	267,200
	Steel Sheet Pile	36,000	SF	12.50	450,000
	Cell Fill	6,400	CY	5.00	32,000
	Backfill	12,000	CY	2.00	24,000
	Handrail	875	LF	12.00	10,500
	Mitigation				
	Water Control Structure	—	LS	16,000.00	16,000
	Wetland Development	31,000	CY	3.20	99,200
	Contingencies				532,350
	Subtotal				3,143,000
10.	Breakwaters				
	Mob & Demob	—	LS	58,000	58,000
	Armor Stone 6.5 - 15 Tons	3800	TN	35.00	133,000
	3.0 - 6.5 Tons	7200	TN	36.00	259,200
	0.5 - 3.0 Tons	1200	TN	30.00	36,000
	Underlayer 0.5 - 1.5 Tons	800	TN	30.00	24,000
	0.1 - 0.65 Tons	1100	TN	32.00	35,200
	70 - 250 Lb	600	TN	33.50	20,100
	Bedding Chips - 150 Lb	6300	TN	24.50	154,350
	Handrail (West Breakwater only)	650	LF	12.00	7,800
	Navigation Light Foundations	2	EA	4400.00	8,800
	Contingencies				151,550
	Subtotal				888,000
14.	Recreational Facilities (East Breakwater only)				
	Handrail	400	LF	12.00	4800
	Walkway	250	CY	167.00	41750
	Contingencies				9450
	Subtotal				56,000
30.	Engineering and Design				350,000
31.	Supervision and Administration				343,000
	TOTAL PROJECT COSTS				5,230,000

ENG FORM 1738 APR 67 SUPERSEDES ENG FORM 1738, 1 APR 54, WHICH IS OBSOLETE.

REASONABLE CONTRACT ESTIMATE TABLE C-6 (cont'd) **SHEET** 2 **OF** 2

PROJECT Geneva-on-the-Lake, OH Small Boat Harbor Alternative 3b Project Costs (Oct. 1980 PL)

INVITATION NO.

ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE	ESTIMATED AMOUNT
	Aids to Navigation	2	EA	35,000	70,000
	Total Project Cost				5,350,000
	Lands and Damages				484,000
	Total				5,834,000
	Annual Maintenance				
	Channels and Breakwaters[1]				(92,100)
	Aids to Navigation				(400)
	Recreation				(1900)
	Mitigation				(5900)
	Total				100,300
	Non-Federal Costs				3,124,000
	50% of Project Costs less Aids to Navigation				(2,640,000)
	Cash Contribution for Navigation				2,604,000
	Cash Contribution for Recreation				36,000
	Lands and Damages				(484,000)
	Federal Costs				2,710,000
	50% of Project Costs				(2,640,000)
	Aids to Navigation				(70,000)
	[1] Includes annual sand by-pass costs.				

ENG FORM 1738 APR 67 SUPERSEDES ENG FORM 1738, 1 APR 54, WHICH IS OBSOLETE.

REASONABLE CONTRACT ESTIMATE TABLE C-6a					SHEET 1 OF 2
PROJECT GENEVA-ON-THE-LAKE, OH. SMALL BOAT HARBOR ALTERNATIVE NO. 3b PROJECT COSTS (AUGUST 1981 P.L.)					INVITATION NO.
ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE	ESTIMATED AMOUNT
09	CHANNELS				
	Mob and Demob		LS	63,000	63,000
	Dredging	4,000	CY	10.00	40,000
	Excavation				
	Overburden	78,000	CY	4.00	312,000
	Till	78,000	CY	7.50	585,000
	Rock	18,000	CY	22.50	405,000
	Rip-rap slope - Stone	8,500	SY	47.00	408,900
	Backfill	5,500	CY	2.00	11,000
	Landscaping		LS	37,000	37,000
	Diaphram Cell Wall - Concrete	1,600	CY	182.00	291,200
	Steel Sheet Pile	36,000	SF	14.00	504,000
	Cell Fill	6,400	CY	5.50	35,200
	Backfill	12,000	CY	2.00	24,000
	Handrail	875	LF	13.00	11,375
	Mitigation				
	Water Control Structure		LS	17,500	17,500
	Wetland Development	31,000	CY	3.50	108,500
	Contingencies				572,325
	Subtotal				3,426,000
10.	BREAKWATERS				
	Mob and Demob		LS	63,000	63,000
	Armor Stone 6.5-15 Tons	3800	TN	37.50	142,500
	3.0-6.5 Tons	7200	TN	39.00	280,800
	0.5-3.0 Tons	1200	TN	32.50	39,000
	Underlayer 0.5-1.5 Tons	800	TN	32.50	26,000
	0.1-0.65 Tons	1100	TN	34.50	37,950
	70-250 Lb.	600	TN	36.50	21,900
	Bedding Chips - 150 Lb.	6300	TN	26.50	166,950
	Handrail (West Breakwater only)	650	LF	13.00	8,450
	Navigation Light Foundation	2	EA	4,800	9,600
	Contingencies				159,850
	Subtotal				956,000
14.	RECREATIONAL FACILITIES (East Breakwater Only)				
	Handrail	400	LF	13.00	5,200
	Walkway	250	CY	182.00	45,500
	Contingencies				10,300
	Subtotal				61,000
30.	ENGINEERING & DESIGN				914,000
31.	SUPERVISION & ADMINISTRATION				383,000
	TOTAL PROJECT COSTS				5,740,000

ENG FORM APR 67 1738 SUPERSEDES ENG FORM 1738, 1 APR 54, WHICH IS OBSOLETE

REASONABLE CONTRACT ESTIMATE TABLE - C6a (con'd)					SHEET 2 OF 2
PROJECT GENEVA-ON-THE-LAKE, OH SMALL BOAT HARBOR ALTERNATIVE NO. 3b PROJECT COSTS (AUGUST 1981 P.L.)					INVITATION NO.
ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE	ESTIMATED AMOUNT
	Aids to Navigation	2	EA.	38,000	76,000
	TOTAL PROJECT COSTS				5,816,000
	Lands and Damages				493,000
	TOTAL				6,309,000
	ANNUAL MAINTENANCE				
	Channels and Breakwaters 1/				(100,300)
	Aids to Navigation				(500)
	Recreation				(2,000)
	Mitigation				(6,400)
	Total				109,200
	NON-FEDERAL COSTS				3,363,000
	50% of Project Costs less Aids to Navigation				(2,870,000)
	Cash Contribution for Navigation				2,830,000
	Cash Contribution for Recreation				40,000
	Lands and Damages				(493,000)
	FEDERAL COSTS				2,946,000
	50% of Project Costs				(2,870,000)
	Aids to Navigation				(76,000)
	1/ Includes annual sand by-pass costs.				

ENG FORM APR 67 1738 SUPERSEDES ENG FORM 1738, 1 APR 54, WHICH IS OBSOLETE.

Table C7 - Estimate of Annual Charges 1/
Alternative No. 1

Item	Federal	Non-Federal 2/	Total 2/
	$	$	$
First Cost	2,388,000	2,500,000	4,888,000
Interest During Construction	176,100	184,400	360,500
Total Investment Cost	2,564,100	2,684,400	5,248,500
Lands and Damages	0	628,000	628,000
Total Project Costs	2,564,100	3,312,400	5,876,500
Annual Charges			
Interest	189,100	244,300	433,400
Amortization	5,500	7,200	12,700
Maintenance	45,500	5,800	51,300
Total	240,100	257,300	497,400

1/ Based on October 1980 price levels, 7-3/8 percent interest rate, and a 50-year economic life.

2/ Does not include self-liquidating cost for mooring area, launching ramps, and public service facilities currently estimated at $4,800,000 (October 1980 price levels).

Table C8 - Estimate of Annual Charges [1]
Alternative No. 2

Item	Federal	Non-Federal[2]	Total[2]
	$	$	$
First Cost	2,456,000	2,400,000	4,856,000
Interest During Construction	181,100	177,000	358,100
Total Investment Cost	2,637,100	2,577,000	5,214,100
Lands and Damages	0	198,000	198,000
Total Project Costs	2,637,100	2,775,000	5,412,100
Annual Charges			
Interest	194,500	204,700	399,200
Amortization	5,700	6,000	11,700
Maintenance	41,900	9,500	51,400
Total	242,100	220,200	462,300

1/ Based on October 1980 price levels, 7-3/8 percent interest rate, and a 50-year economic life.

2/ Does not include self-liquidating cost for mooring area, launching ramps, and public service facilities currently estimated at $4,140,000 (October 1980 price levels).

Table C9 - Estimate of Annual Charges 1/
Alternative No. 3

Item	Federal	Non-Federal 2/	Total 2/
	$	$	$
First Cost	1,888,000	1,860,000	3,748,000
Interest During Construction	139,200	137,200	276,400
Total Investment Cost	2,027,200	1,997,200	4,024,400
Lands and Damages	0	506,000	506,000
Total Project Costs	2,027,200	2,503,200	4,530,400
Annual Charges			
Interest	149,500	184,600	334,100
Amortization	4,400	5,400	9,800
Maintenance	33,700	5,200	38,900
Total	187,600	195,200	382,800

1/ Based on October 1980 price levels, 7-3/8 percent interest rate, and a 50-year economic life.

2/ Does not include self-liquidating cost for mooring area, launching ramps, and public service facilities currently estimated at $4,780,000 (October 1980 price levels).

Table C10 - Estimate of Annual Charges 1/
Alternative No. 4

Item	Federal	Non-Federal 2/	Total 2/
	$	$	$
First Cost	1,668,000	1,640,000	3,308,000
Interest During Construction	123,000	121,000	244,000
Total Investment Cost	1,791,000	1,761,000	3,552,000
Lands and Damages	0	135,000	135,000
Total Project Costs	1,791,000	1,896,000	3,687,000
Annual Charges			
Interest	132,100	139,800	271,900
Amortization	3,900	4,100	8,000
Maintenance	32,400	4,500	36,900
Total	168,400	148,400	316,800

1/ Based on October 1980 price levels, 7-3/8 percent interest rate, and a 50-year economic life.

2/ Does not include self-liquidating cost for mooring area, launching ramps, and public service facilities currently estimated at $4,370,000 (October 1980 price levels).

Table C11 - Estimate of Annual Charges[1]
Alternative 3b

Item	Federal: Navigation	Federal: Recreational Fishing	Federal: Total	Non-Federal[2]: Navigation	Non-Federal[2]: Recreational Fishing	Non-Federal[2]: Total	Total[2]: Navigation	Total[2]: Recreational Fishing	Total[2]: Total
	$	$	$	$	$	$	$	$	$
First Cost	2,674,000	36,000	2,710,000	2,604,000	36,000	2,640,000	5,278,000	72,000	5,350,000
Interest During Construction	197,200	2,700	199,900	192,000	2,700	194,700	389,200	5,400	394,600
Total Investment Cost	2,871,200	38,700	2,909,900	2,796,000	38,700	2,834,700	5,667,200	77,400	5,744,600
Lands and Damages	0	0	0	484,000	0	484,000	484,000	0	484,000
Total Project Costs	2,871,200	38,700	2,909,900	3,280,000	38,700	3,318,700	6,151,200	77,400	6,228,600
Annual Charges									
Interest	211,700	2,900	214,600	241,900	2,900	244,800	453,600	5,800	459,400
Amortization	6,200	100	6,300	7,100	100	7,200	13,300	200	13,500
Maintenance	92,600	0	92,600	5,900	1,800	7,700	98,500	1,800	100,300
Total.	310,500	3,000	313,500	254,900	4,800	259,700	565,400	7,800	573,200

1/ Based on October 1980 price levels, 7-3/8 percent interest rate, and a 50-year economic life.
2/ Does not include self-liquidating cost for mooring area, launching ramps, and public service facilities currently estimated at $5,920,000 (October 1980 price levels).

Table C11a - Estimate of Annual Charges[1/]
Alternative 3b

Item	Federal			Non-Federal[2/]			Total[2/]		
	Navigation	Recreational Fishing	Total	Navigation	Recreational Fishing	Total	Navigation	Recreational Fishing	Total
	$	$	$	$	$	$	$	$	$
First Cost	2,906,000	40,000	2,946,000	2,830,000	40,000	2,870,000	5,736,000	80,000	5,816,000
Interest During Construction	214,300	3,000	217,300	208,700	3,000	211,700	423,000	6,000	429,000
Total Investment Cost	3,120,300	43,000	3,163,300	3,038,700	43,000	3,081,700	6,159,000	86,000	6,245,000
Lands and Damages	0	0	0	493,000	0	493,000	493,000	0	493,000
Total Project Costs	3,120,300	43,000	3,163,300	3,531,700	43,000	3,574,700	6,652,000	86,000	6,738,000
Annual Charges									
Interest	230,100	3,200	233,300	260,400	3,200	263,600	490,500	6,400	496,900
Amortization	6,700	100	6,800	7,600	100	7,700	14,300	200	14,500
Maintenance	100,800	0	100,800	6,400	2,000	8,400	107,200	2,000	109,200
Total	337,600	3,300	340,900	274,400	5,300	279,700	612,000	8,600	620,600

1/ Based on August 1981 price levels, 7-3/8 percent interest rate, and a 50-year economic life.
2/ Does not include self-liquidating cost for mooring area, launching ramps, and public service facilities currently estimated at $6,340,000 (August 1981 price levels).

APPENDIX D

ECONOMIC EVALUATION

GENEVA-ON-THE-LAKE SMALL-BOAT HARBOR

FINAL REFORMULATION PHASE I GENERAL DESIGN MEMORANDUM

U. S. Army Engineer District, Buffalo
1776 Niagara Street
Buffalo, NY 14207

S. Cooper, Economist
R. Guido, Economist

GENEVA-ON-THE-LAKE, OH
FINAL PHASE I REFORMULATION
GENERAL DESIGN MEMORANDUM

APPENDIX D
ECONOMIC EVALUATION

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FACT SHEET

Project Interest Rate	7-3/8 percent
Project Evaluation Period	1985-2035
Price Level	August 1981
Project Economists	Sharon Cooper, Economist Ronald Guido, Chief, Economics Section
Selected Plan	Alternative 3b
Average Annual Benefits	$924,200
Average Annual Costs	620,600
Net Benefits	303,600
Benefit-Cost Ratio	1.49

INTRODUCTION

D1. Geneva-on-the-Lake is located on the south shore of Lake Erie about 17 miles east of Fairport Harbor, OH, and 12 miles west of Ashtabula Harbor, OH, both of which are Federally improved deep-draft harbors. Geneva-on-the-Lake was identified as a promising location for a small-boat harbor and harbor-of-refuge because of its strategic location within the boundaries of a State recreational park which is presently being developed by the State of Ohio. In its present condition, Geneva State Park offers no recreational facilities for boaters who desire to use Lake Erie. The closest facilities are located in Ashtabula Harbor, OH, and in Fairport Harbor. However, the existing facilities for recreational boating at these two harbors are currently utilized to full capacity with long waiting lists for permanent dock space. The Ohio Department of Natural Resources has stated that they consider development of a small-boat harbor facility at Geneva State Park imperative to promoting optimum use of the park and to satisfying the large-scale demand of perspective and existing small-boat owners in the northeast section of the State of Ohio. The economic benefits resulting from the proposed project that are developed in the economics appendix are comprised of recreational benefits of boaters and recreational fishing.

METHODOLOGY FOR DEMAND FORECASTS.

D2. In order to calculate the benefits from recreational boating, it is necessary to forecast the demand for boating over the project evaluation period. The Ohio Department of Natural Resources has developed participation rates for 18 recreation activities, in its 1975-1980 Ohio State Comprehensive Outdoor Recreation Plan (SCORP). Included are participation rates for boating (power boating), sailing, and fishing. The Ohio SCORP methodology is based on the average household participation for activity occasions during peak periods. The largest demand for boating and fishing occurs on weekends and holidays which are peak usage periods. Projections made on the basis of total demand, both the weekday demand and the weekend demand would produce an averaging of the demand for the peak and off-peak periods, which would give an unrealistic appraisal of both periods. Therefore, it is considered more meaningful to make forecasts of demand for weekends and holidays separate from weekday demand. Participation rates used in the demand analysis are for peak periods. Participation rates for each of the recreation activities were calculated by the State of Ohio as the weighted average of participation rates of as many as 35 socioeconomic variables and eight supply-accessibility variables. The weights were determined by the significance level for those variables having a level of significance equal to or less than 0.1 in a chi-square contingency table. A participation rate was calculated for each of 15 planning regions in the State of Ohio for each of the 18 recreation activities. The planning regions are comprised of three or more counties.

D3. The element of distance is taken into account by defining two origin zones. Zone 1 is comprised of Ashtabula County, Ohio, which is the county of the proposed project. Zone 2 is broadly defined as the Cleveland, Akron, Youngstown-Warren SMSA's in Ohio, and the Erie SMSA in Pennsylvania.

D4. The regions for which participation rates where calculated in SCORP do not correspond perfectly with the SMSA's in the two origin zones defined in this study. Specifically, the participation rate used in this study for each of the SMSA's is the participation rate for the SCORP region containing the particular SMSA. To arrive at a single participation rate for Zone 2, the participation rates for each of the SMSA's in Zone 2 were weighted by the proportion of the total population in Zone 2 accounted for by each of the Zone 2 SMSA's. The participation rate for the Ohio planning region adjacent to the Erie SMSA was used to represent the Erie SMSA area in Zone 2.

D5. SCORP provides participation rates for 1975, 1980, and 1990. A linear extrapolation, over time, was utilized to yield decadal participation rates for 1970 through 2030. The participation rates were not determined for 2035 since demand exceeds supply during the base year of the project. These participation rates, together with projections of households for each of the origin zones, are the bases for forecasting boating demand. Table D1 provides the values for the socioeconomic variables while Table D2 contains the participation rates. The participation rate is the number of times members of a household participate in an outdoor recreation activity on peak days during the year. The rates were developed from a mail questionnaire survey sent to 32,922 households in Ohio.

Table D1 - Socio-Economic Variables

Zone 5/	Population 1/		Households 1/		Income 2/		Household Size 3/		Leisure Time 4/	
	1	2	1	2	1	2	1	2	1	2
1970	98,200	3,543,200	30,400	1,097,000	5,040	6,250	3.23	3.23	25.0	25.0
1980	111,200	3,779,100	37,800	1,285,400	7,860	8,130	2.94	2.94	27.0	27.0
1990	122,700	4,032,700	44,000	1,445,400	11,750	10,630	2.79	2.79	28.75	28.75
2000	132,600	4,202,500	49,700	1,573,900	15,780	13,970	2.67	2.67	30.6	30.6
2010	141,500	4,406,600	54,800	1,708,000	19,760	17,780	2.58	2.58	32.0	32.0
2020	148,400	4,533,900	59,100	1,806,300	23,900	22,760	2.51	2.51	33.0	33.0
2030	156,600	4,647,700	64,200	1,904,800	27,420	30,000	2.44	2.44	34.0	34.0

1/ Source: Ohio Dept. of Economic and Community Development, 1974. 2010-2030 are extrapolations of a trend.

2/ In 1976 Dollars. Source: 1972 OBERS Projections adjusted for population differences.

3/ Source: Ohio State Dept. of Natural Resources, Ohio State Comprehensive Outdoor Recreation Plan, 1975. 2000-2030 are extrapolations of trends.

4/ Source: "Prospective Demand for Outdoor Recreation," Outdoor Recreation Resources Review Commission, 1962. 2010-2030 are extrapolations of trends.

5/ Zone 1 - Ashtabula County
Zone 2 - Cleveland SMSA, Akron SMSA, Youngstown-Warren SMSA's in Ohio, Erie SMSA Pennsylvania.

Table D2 - Participation Rates

	Powerboating		Sailing		Fishing	
	Zone 1	Zone 2	Zone 1	Zone 2	Zone 1	Zone 2
1970	3.01	3.032	.380	.401	4.964	4.969
1980	2.98	3.007	.385	.410	4.958	4.963
1990	2.946	2.982	.393	.423	4.952	4.957
2000	2.91	2.956	.400	.438	4.946	4.952
2010	2.88	2.939	.410	.450	4.941	4.946
2020	2.84	2.911	.420	.467	4.937	4.940
2030	2.81	2.883	.430	.477	4.934	4.939

D6. Peak day participation rates multiplied by total households will equal annual peak-day activity occasions. Divide by the number of annual peak-days (24 - boating, 27 - sailing, 38 - fishing), to arrive at peak-day recreationists, by activity. This is shown below in Table D3 for powerboating, sailing, and fishing.

Table D3 - Number of Recreationists per Peak-Day, from Origin-Zone

	Powerboating		Sailing		Fishing	
	Zone 1	Zone 2	Zone 1	Zone 2	Zone 1	Zone 2
1970	3,810	138,590	430	16,290	12,830	463,330
1980	4,690	161,050	540	19,510	14,500	493,970
1990	5,410	179,590	640	22,640	16,000	526,050
2000	6,030	193,850	740	25,530	17,270	547,630
2010	6,580	209,160	830	29,540	18,380	573,560
2020	6,990	219,090	920	31,240	19,270	589,400
2030	7,510	228,810	1,020	33,650	20,340	604,080

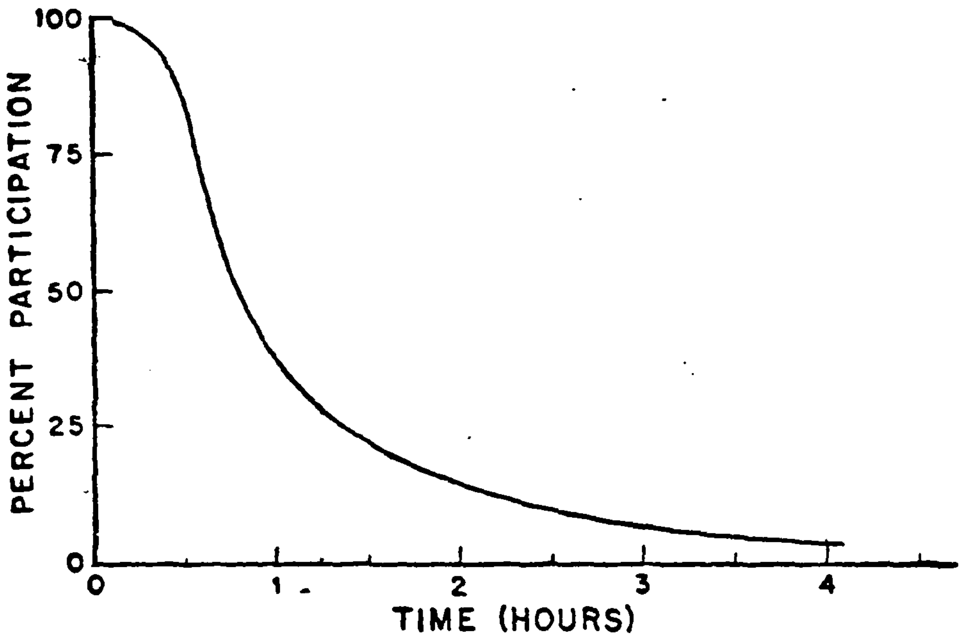
D7. Fishing will be evaluated separately, beginning in paragraph D30. The boaters (defined as powerboaters and sailors) are identified by origin-zone. The next step is to identify what portion of the boaters entering the boating market will be attracted to Ashtabula County. Two parameters are studied: travel time and alternate site competition.

a. Travel Time - All boaters originating in Ashtabula County, Zone 1, are estimated to live within approximately 1/2 hour in travel time from their boating source. New York State's Travel Time - Percent Participation Curve is used to determine the percentage of boaters willing to travel 1/2 hour for a boating activity (Figure D1). Ohio and New York are both highly populated, industrial, northeast States. Their populations are likely to exhibit similar recreation patterns and preferences. The New York curve shows that 92 percent of the boaters are willing to travel 1/2 hour for the activity. The projected boaters for Zone 1 are reduced to account for in-county demand. Zone 2 boaters are assumed to have a population centroid one and one-half hours of travel time from Ashtabula County. The percent willing to travel this distance is 23 percent.

b. Alternate Site - The alternate site factor refers to the likelihood that people within a given travel distance will utilize the marina at Geneva-on-the-Lake as opposed to an alternate site. The boaters in Zone 1, Ashtabula County, located 1/2 hour's distance away, will utilize the boating facilities at Geneva-on-the-Lake as opposed to traveling to an alternate site. Therefore, since the majority of boaters from Ashtabula County are within 1/2 hour's travel distance, they will use Lake Erie facilities. Therefore, the alternate site factor for Zone 1 is 1.000. ODNR in the 1975 SCORP identified county capacities for boating in terms of acres. Ashtabula has 3,732 acres of boating. This is not explicitly stated in SCORP. However, by totalling the inland acreage, it appears that the Lake Erie counties are allocated 1,000 acres. The total of Ohio counties within the expected travel time, plus Erie and Crawford, PA, and Chautauqua County, NY, (Erie and Crawford are estimated from like counties in Ohio, Chautauqua is from NY-SCORP) have 34,564 acres of boating capacity. Ashtabula County's portion of this total is 10.8 percent, so the alternate site factor for Zone 2 boaters is .108. By applying travel time and alternate site factors, the number of peak-day boaters in Ashtabula County is found for each year.

Multiplying the number of peak-day boaters in Table D3 by the travel-time and alternate site factor appropriate to each zone yields Peak Day Boaters in Ashtabula County (Table D4).

FIGURE D1



BOATING TRAVEL TIME DECAY CURVE

SOURCE: N.Y.S. PARKS AND RECREATION DEPT.; COMPREHENSIVE RECREATION PLAN, 1972.

Table D4 - Peak-Day Boaters in Ashtabula County

	Powerboaters		Sailors	
	Zone 1	Zone 2	Zone 1	Zone 2
1970	3,500	3,430	390	550
1980	4,300	3,990	490	660
1990	5,000	4,450	590	760
2000	5,500	4,800	680	860
2010	6,000	5,180	760	1,000
2020	6,400	5,430	840	1,050
2030	6,900	5,670	940	1,140

D8. The participants are correlated to boats. The 2.5 persons per boat standard is cited in the Ohio SCORP, 1980-1985. The recreational boaters using Geneva-on-the-Lake during the boating season are also likely to be summer vacationers. The typical summer vacation unit is the household. The median number of persons per household for the cities in demand origin zones 1 and 2 was determined by examining the Ohio Census of Housing, 1970. Akron, Cleveland, Cleveland Heights, Euclid, Lakewood, Parma, Warren, and Youngstown have a median number of persons per household of 2.5, 2.4, 2.5, 2.4, 2.2, 3.1, 2.7, and 2.6, respectively. This yields an average median number of persons per household of 2.55. The urban areas of Ohio are the major sources of recreational boaters. The median number of persons per household for urban areas in Ohio is 2.7. The project persons per boat standard, based on the Ohio SCORP and the Ohio Census of Housing, is 2.5. The evaluation is based on the 2.5 persons per boat standard. A 3.0, 3.5, and 4.0 persons per boat standard was also used to conduct sensitivity analyses. The peak-day boaters are divided by this number to arrive at the number of boats.

D9. The next step is to determine what boats in use would be permanently kept in moorings and berths, and what boats would be trailered. This is accomplished by associating trailerings to the small-boat sizes. ODNR boater registration statistics show that 66.7 percent of all sailboats and 57.8 percent of all power boats are 16 feet or less in length. Ninety percent of these are estimated to be trailered. Therefore, multiplying number of peak-day boats by [(.578) (.90)], for powerboats, and [(.667) (.90)], for sailboats, yields trailered power boats and trailered sailboats. Subtracting the number of trailered boats in each category from the number of peak-day boats in the corresponding category yields permanent boats, in each category. Table D5 provides the results of these calculations for the 2.5 persons per boat standard and the 3.0 persons per boat standard.

Table D5 - Permanent and Trailered Boats in Ashtabula County per Peak Day
(2.5 Persons Per Boat)

	Powerboats				Sailboats			
	Zone 1		Zone 2		Zone 1		Zone 2	
	Permanent	Trailered	Permanent	Trailered	Permanent	Trailered	Permanent	Trailered
1970	670	730	660	710	70	90	90	130
1980	820	900	770	830	80	120	100	160
1990	960	1,040	850	930	100	140	120	180
2000	1,060	1,140	920	1,000	110	160	130	210
2010	1,150	1,250	990	1,080	120	180	160	240
2020	1,230	1,330	1,040	1,130	140	200	170	250
2030	1,320	1,440	1,090	1,180	150	230	180	280

Table D5 - Permanent and Trailered Boats in Ashtabula County per Peak Day (Cont'd)
(3.0 Persons Per Boat)

	Powerboats				Sailboats			
	Zone 1		Zone 2		Zone 1		Zone 2	
	Permanent	Trailered	Permanent	Trailered	Permanent	Trailered	Permanent	Trailered
1970	560	610	550	590	50	80	70	110
1980	690	740	640	690	60	100	90	130
1990	800	870	710	770	80	120	100	150
2000	880	950	770	830	90	140	120	170
2010	960	1,040	830	900	100	150	130	200
2020	1,020	1,110	870	940	110	170	140	210
2030	1,100	1,200	910	980	120	190	150	230

DEMAND FORECASTS - BOATING

D10. The final step in allocating boating demand to Ashtabula County's Lake Erie shoreline is a comparison of facility location within the county. Lake Erie facilities in Ashtabula County consist of 800 moorings and 14 launch ramps.

These facilities are as follows:

	Wet Berths/Slips
City of Conneaut	150
Conneaut Boat Club	58
Snug Harbor Marina	20
Sutherland Marina	25
Ashtabula Yacht Club, Inc.	110
Jack's Marine	200
Riverside Yacht Club, Inc.	30
Redbrook Boat Club	150
Brockway Marine	30
	773, say 800

Source: Boating Facilities Inventory, Draft Final Report, 18 July 1980, Midwest Research Institute.

Inland facilities (Pymatuning Reservoir) have approximately 500 moorings and 10 launch ramps. However, the Pymatuning Reservoir has a 10-horsepower limitation for outboard motors which greatly limits potential uses. Fishing is the dominant boating activity at Pymatuning Reservoir. The reservoir is also unsuitable for sailboating since the northeast part of the lake is congested with tree stumps and wetland areas. Conversations with planning staffs in the area indicated that only small car-top type sailcraft use this reservoir for sailing. Therefore, 100 percent of the permanent sailboats and 100 percent of the trailered sailboats will be attracted to Lake Erie facilities. Powered boats will have 100 percent of the permanent boats greater than 16 feet going to Lake Erie. For boats less than or equal to 16 feet, 60 percent will be attracted to Lake Erie and 40 percent will be attracted to the Pymatuning Reservoir. All of the trailered boats will be attracted to Lake Erie. Table D6 provides the allocation of boats on Lake Erie on Ashtabula County's shoreline.

Table D6 - Demand on Lake Erie Based on Distribution of Facilities and Distribution of Demand (2.5 Persons Per Boat)

	Power Boats						Sailboats					
	Permanent			Trailered			Permanent			Trailered		
	1	2	Total	1	2	Total	1	2	Total	1	2	Total
1970	640	630	1,270	730	710	1,440	60	80	140	90	130	220
1980	790	730	1,520	900	830	1,730	70	100	170	120	160	280
1990	910	810	1,720	1,040	930	1,970	90	110	200	140	180	320
2000	1,010	880	1,890	1,140	1,000	2,140	100	130	230	160	210	370
2010	1,100	950	2,050	1,250	1,080	2,330	110	150	260	180	240	420
2020	1,170	990	2,160	1,330	1,130	2,460	130	160	290	200	250	450
2030	1,260	1,040	2,300	1,440	1,180	2,620	140	170	310	230	280	510

Table D6 - Demand on Lake Erie Based on Distribution of Facilities and Distribution of Demand (Cont'd) (3.0 Persons Per Boat)

	Power Boats						Sailboats					
	Permanent			Trailered			Permanent			Trailered		
	1	2	Total	1	2	Total	1	2	Total	1	2	Total
1970	530	520	1,050	610	590	1,200	50	70	120	80	110	190
1980	650	610	1,260	740	690	1,430	60	90	150	100	130	230
1990	760	670	1,430	870	770	1,640	80	100	180	120	150	270
2000	840	730	1,570	950	830	1,780	90	120	210	140	170	310
2010	910	790	1,700	1,040	900	1,940	100	130	230	150	200	350
2020	970	830	1,800	1,110	940	2,050	110	140	250	170	210	380
2030	1,050	870	1,920	1,200	980	2,180	120	150	270	190	230	420

D11. At this point, we can combine the zones to arrive at total demand for permanent moorings on the Lake Erie coast in Ashtabula County (Table D7). Trailered boats will be discussed later.

Table D7 - Demand for Permanent Moorings on Lake Erie

2.5 Persons Per Boat

	Power			Sail			Total		
	1	2	Total	1	2	Total	1	2	Total
1970	640	630	1,270	60	80	140	700	710	1,410
1980	790	730	1,520	70	100	170	860	830	1,690
1990	910	810	1,720	90	110	200	1,000	920	1,920
2000	1,010	880	1,890	100	130	230	1,110	1,010	2,120
2010	1,100	950	2,050	110	150	260	1,210	1,100	2,310
2020	1,170	990	2,160	130	160	290	1,300	1,150	2,450
2030	1,260	1,040	2,300	140	170	310	1,400	1,210	2,610

3.0 Persons Per Boat

	Power			Sail			Total		
	1	2	Total	1	2	Total	1	2	Total
1970	530	520	1,050	50	70	120	580	590	1,170
1980	650	610	1,260	60	90	150	710	700	1,410
1990	760	670	1,430	80	100	180	840	770	1,610
2000	840	730	1,570	90	120	210	930	850	1,780
2010	910	790	1,700	100	130	230	1,010	920	1,930
2020	970	830	1,800	110	140	250	1,080	970	2,050
2030	1,050	870	1,920	120	150	270	1,170	1,020	2,190

D12. The 2.5 persons per boat standard shows an existing demand of 1,690 moorings. The 3.0 persons per boat standard yields an existing demand of 1,410 moorings. The 3.5 persons per boat standard yields a demand of 1,320 moorings in 1985. The 4.0 persons per boat standard yields a demand of 1,165 moorings in 1985.

FLEET MIX FOR ALLOCATION OF DEMAND

D13. The demand projections in Tables D6 and D7 provide a division of demand between power boats and sailboats. Calculation of benefits will require, that the projected demand be delineated further in terms of a fleet mix -- type and size of craft within each category. The existing capacity of 800 boats was determined on the basis of the Midwest Research Institute, Boating Facilities Inventory, Draft Final Report, 18 July 1980, DACW49-79-R-0020, for Conneaut and Ashtabula Harbors in Ashtabula County. The Great Lakes Framework Commission Study, provided a basis for constructing the existing fleet mix for these 800 boats as presented in Table D8. The proportions that each boat type and boat length of the total number in its respective boat category (power vs. sail) will be the basis for determining the fleet mix in the demand projections. This relationship was held constant over the life of the project. The analysis of economic efficiency will be based on a 360-berth marina facility.

Table D8 - Present Fleet Distribution at Ashtabula and Conneaut

OB 16	OB 16-25	IB 16-25	C 16-25	C 26-39	C 40-64	Total Power	S 16	S 16-25	AS 16-25	AS 26-39	AS 40-64	Total Sail	Total
56	24	104	54	364	61	663	11	11	13	89	13	137	800

OB - Outboard
IB - Inboard
C - Cruiser
S - Sailboat
AS - Auxiliary Sailboat

Source: Recreational Boating, Appendix R9, Great Lakes Basin Framework Study, Great Lakes Basin Commission, 1975, fleet mix at Fairport and Ashtabula Harbors.

D14. Table D7 indicates that the demand for permanent moorings will reach 1,920 by 1990. The existing capacity on Lake Erie in Ashtabula County is for 800 moorings. Since the total capacity created by the 360-berth facility will be for 1,160 moorings, it is apparent that demand for moorings will exceed supply in 1990.

CALCULATION OF BENEFITS FOR PERMANENT MOORINGS

D15. The fleet mix proportions from Table D8 are used to determine the expected fleet-in-use at Geneva for the 360-berth facility (Table D9). It is assumed that 20 berths will be utilized by transients, primarily overnight park visitors trailering their boats to Geneva State Park and boaters cruising the south shore of Lake Erie.

Table D9 - Fleet in Use at Geneva

OB 16	OB 16-25	IB 16-25	C 16-25	C 26-39	C 40-64	Total Power	Transient	Total Mooring
26	12	44	23	161	26	292		
S 16	S 16-25	AS 16-25	AS 26-39	AS 40-64		Total Sail	20	360
4	4	5	30	5		48		

D16. One fleet is developed for benefit calculations, new boats at Geneva. Due to Geneva's location along Lake Erie, the rates of return used in the benefit calculations for the Geneva site are assumed to be the maximum regional rates of return. Average depreciated values are derived from ABOS 1978 Retail Boat Prices, Since the prices from this source are 1977 values, they are updated by gains in the entertainment index component of the consumer price index. The average depreciated values are one-half the total retail price of a new boat of the type and size. The benefit calculations are shown for the 360-boat facility, in Table D10. The benefits are derived by deducting cruise time from the gross depreciated value percentage return of 340 new boats. Total benefits for new boats are $693,230.

CALCULATION OF BENEFITS FOR TRAILERED AND TRANSIENT BOATS

D17. Trailered Fleet. Trailer launchings are calculated in a slightly different manner. The number of peak-day launchings for power and sail have been calculated in Table D5. The demand for powerboats and sailboats is allocated according to the supply capacity of available ramps.

Table D10 - New Boats at 360-Berth Facility at Geneva-on-the-Lake

Type	Class	Size	Number of Boats	Average Depreciated Value	Rates of Return: Ideal	Rates of Return: Max.	Rates of Return: Pres.	Rates of Return: Future	Gain	Value	On Cruise: Average Days Use	On Cruise: Average Days on Cruise	On Cruise: Percent Use	On Cruise: Value
		(feet)		$						$				$
Outboard		Less Than 16	26	1,331	15	13	-	13	13	4,499				
Outboard		16-25	12	3,883	15	13	-	13	13	6,057				
Inboard		16-25	44	7,710	12	10.5	-	10.5	10.5	35,620				
Cruiser		16-25	23	8,078	9	8	-	8	8	14,864				
Cruiser		26-39	161	30,238	9	8	-	8	8	389,465	42	3	7.1	27,652
Cruiser		40-64	26	108,243	9	8	-	8	8	225,145	42	7	16.7	37,599
Sailboat		Less Than 16	4	939	12	10.5	-	10.5	10.5	394				
Sailboat		16-25	4	4,932	12	10.5	-	10.5	10.5	2,071				
Auxiliary Sailboat		16-25	5	11,622	9	8	-	8	8	4,649				
Auxiliary Sailboat		26-39	30	25,092	9	8	-	8	8	60,221	42	3	7.1	4,276
Auxiliary Sailboat		40-64	5	59,341	9	8	-	8	8	23,736	42	7	16.7	3,964
Total			340							766,721				73,491

D18. The 1975 Ohio SCORP estimates instant peak-day capacity/per ramp of 20 boats. This is based on including one acre of parking for 20 cars and trailers. A turnover rate of 2.0 is applied to arrive at daily peak-day capacity of 40 launches per ramp. With 14 ramps in Ashtabula County, there can be 560 launches per peak-day. The proposed improvements will add six ramps, or provide for 240 additional peak-day launches. This would yield a 800 peak-day launch capacity, which would have been insufficient to meet the 1970 demand for 1,660 peak-day launches.

D19. The boat launching season lasts for 180 days (mid-April to mid-October). There are 50 days which would prohibit powerboating (precipitation) and 60 days which prohibit sailing (wind speed, precipitation). This is based on long-range climate averages. Annual ramp supply capacities are calculated as follows: follows:

	Annual Capacity per Launch Ramp	
	Power	Sail
No. Day Season	180	180
No. Prohibitive Days	50	60
	130	120
No. Peak Days	24	27
No. Nonpeak Days	106	93
Launches/Peak Day	40	40
Launches/Nonpeak[1/]	18	18
Annual Launches	2,868	2,754

D20. Based on Table D6, 2.5 persons per boat, demand for launches in 1985 is 86 percent for powerboats and 14 percent for sailboats. The power capacity, 2,868 annual launches, is multiplied by the 86 percent demand for powerboats to yield 2,466 annual powerboat launches. The sail capacity, 2,754 annual launches is multiplied by the 14 percent demand for sailboats to yield 386 annual sailboat launches per ramp. Since there are 2,466 powerboat launches per ramp and 386 sailboat launches per ramp, total annual ramp capacity is 2,852 launches. There are 14 ramps in Ashtabula County, resulting in a 39,928 annual launch capacity on Lake Erie. The proposed improvements will add six ramps, or provide for 17,112 additional launchings per year.

D21. With a 2.5 persons per boat standard, peak-day launch demand is for 1,850 powerboats and 300 sailboats. The power launches (86 percent) will then account for 14,716 of the annual launches added while sail (14 percent) accounts for 2,396 of the annual launches added. Equivalent boats are found by dividing launches by user-days (50, based on New York State average; 42, for the project to reflect greater benefits to moored boats).[1/] This results in 350.4 equivalent powerboats and 57 equivalent sailboats. The benefits for trailered boats are determined in Table D11.

D22. Based on Table D6, 3.0 persons per boat, demand for launches in 1985 is 86 percent for powerboats and 14 percent for sailboats. The total annual ramp capacity is 2,852 launches as determined in the 2.5 persons per boat standard. The proposed improvements will add six ramps, or provide for

1/ Based on New York State Park and Recreation Calculations.

17,112 additional launchings per year. With a 3.0 persons per boat standard, peak-day launch demand is for 1,540 powerboats and 250 sailboats. The power launches (86 percent) will then account for 14,716 of the annual launches added while sail (14 percent) accounts for 2,396 of the annual launches added. All launches are assumed to be less than 16 feet. Equivalent boats are found by dividing launches by 42 user-days. There are 350.4 equivalent powerboats and 57 equivalent sailboats. Benefits for trailered boats, 3.0 persons per boat, are determined in Table D11.

D23. The 3.5 persons per boat and 4.0 persons per boat were also analyzed for trailered boat benefits. The peak-day launch demand for 3.5 persons per boat in 1985 is 1,315 powerboats and 185 sailboats. Total peak-day launch demand is for 1,500 boats. Powerboats (1,315) accounts for 88 percent of total demand, while sail (185) accounts for 12 percent of total demand. The peak-day launch demand for 4.0 persons per boat is 1,155 powerboats and 165 sailboats. Total peak-day launch demand is for 1,320 boats. Powerboats (1,155) accounts for 88 percent of total demand while sail (165) accounts for 12 percent of demand. The power launches (88 percent) will account for 15,059 of the annual launches added, while sail (12 percent) accounts for 2,053 of the annual launches added. The equivalent boats for 3.5 and 4.0 persons per boat are 358.5 powerboat and 48.9 sailboats. The total benefits for trailered boats, given a 3.5 persons per boat standard and a 4.0 persons per boat are $66,852.

D24. Transient traffic will be unaffected by the development scenario. All transient slips will be utilized on peak-days, three will be used on 50 percent of nonpeak days, one will be used for 25 percent of nonpeak days. The remaining 25 percent of nonpeak days will not have transient visitors due to bad weather boating days. Inclement weather due to unfavorable wind speed and precipitation will eliminate transient traffic to Geneva-on-the-Lake. Therefore, the 360-mooring facility will accommodate 840 transient visits. The visits are distributed to cruisers and auxiliary sailboats greater than 26 feet in length. The methodology yields 32.6 equivalent boats. However, the marina can only accommodate 20 transient boaters per day. Benefits are derived for 20 equivalent boats as shown on Table D12.

360-Mooring Marina					Equiv.	Bts.
Cruisers (26-39)	917	(Days Visit)	42	=	21.8	13.4
Cruisers (40-64)	192	(Days Visit)	42	=	4.6	2.8
Aux. Sail (26-34)	233	(Days Visit)	42	=	5.6	3.4
Aux. Sail (40-64)	27	(Days Visit)	42	=	.6	.4
					32.6	20.0

D25. Of course, boats of these types kept at Geneva would be on cruise for a portion of the season. It is expected that boats 26 feet to 39 feet will be on cruise for 3 days (or 7.1 percent of the season) of their 42 use-days. Larger boats will be on cruise 7 days (or 16.7 percent). The benefit to each boat class will be reduced by these percentages to account for the time spent on crusie.

D26. The benefits for permanent-based boats, modified to reflect time spent on cruise, were shown in Table D10. Tables D11 and D12 show the calculations for trailered and transient boats for the 360-berth marina.

Table D11 - Trailered Boats - 360-Berth Marina
2.5 Persons Per Boat

Type	Launches	Size	Equiv. Number of Boats	Average Depreciated Value	Rates of Return				Value	On Cruise			
					Ideal	Max.	Pres.	Future		Average Days Use	Average Days on Cruise	Percent Use	Value
		(feet)		$					$				$
Outboard	14,716	Under 16'	350.4	1,331	15	13	-	13	60,630				
Sailboat	2,396	Under 16'	57.0	939	12	10.5	-	10.5	5,620				
Total	17,112		407.4						66,250				

Table D11 - Trailered Boats - 360-Berth Marina
3.0 Persons Per Boat

Type	Launches	Size	Equiv. Number of Boats	Average Depreciated Value	Rates of Return				Value	On Cruise			
					Ideal	Max.	Pres.	Future		Average Days Use	Average Days on Cruise	Percent Use	Value
		(feet)		$					$				$
Outboard	14,716	Under 16'	350.4	1,331	15	13	-	13	60,630				
Sailboat	2,396	Under 16'	57.0	939	12	10.5	-	10.5	5,620				
Total	17,112		407.4						66,250				

Table D12 - Transient Boats - 360-Berth Marina

Type	Visit-Days	Size	Equiv. Number of Boats	Average Depreciated Value	Rates of Return				Value	On Cruise			
					Ideal	Max.	Pres.	Future		Average Days Use	Average Days on Cruise	Percent Use	Value
		(feet)		$					$				$
Cruiser	563	26-39	13.4	30,238	9	8	-	8	32,415				
Cruiser	117	40-64	2.8	108,243	9	8	-	8	24,246				
Auxiliary Sailboat	143	26-39	3.4	25,092	9	8	-	8	6,825				
Auxiliary Sailboat	17	40-64	.4	59,341	9	8	-	8	1,899				
Total	840		20.0						65,385				

SUMMARY OF DIRECT NAVIGATION BENEFITS

D27. The average annual benefits for a 360-berth facility, given a 2.5 persons per boat standard and a 3.0 persons per boat standard, are not discounted since there is sufficient demand to assure full utilization of a 360-berth marina in 1985, the base year of the project. Benefit display of direct navigation benefits is in Table D13. Total direct navigation benefits for 3.5 and 4.0 persons per boat are $825,467, including $693,230 for new boats, $66,852 for trailered boats, and $65,385 for transient boats.

Table D13 - Direct Navigation Benefits

	2.5 Persons		3.0 Persons	
	Total	Average Annual Benefits	Total	Average Annual Benefits
360-Mooring Marina				
New	693,230	693,230	693,230	693,230
Trailered	66,250	66,250	66,250	66,250
Transient	65,385	65,385	65,385	65,385
Total	824,865	824,865	824,865	824,865

SUMMARY OF TOTAL NAVIGATION BENEFITS

D28. An additional navigation benefit that would occur at Geneva is for providing refuge. Harbor-of-refuge benefits are attributable to a boating facility that provides safe entrance to a protected mooring area in all weather conditions. Since the proposed plan of improvement will provide protection from storm-generated waves, the harbor will serve as berthing or mooring areas for boats seeking refuge. A $21,300 annual benefit is used to represent this category. Summarizing Navigation Benefits, we obtain:

	Navigation Benefits
2.5 Persons - 360 Berths -	$846,200
3.0 Persons - 360 Berths -	846,200
3.5 Persons - 360 Berths -	846,800
4.0 Persons - 360 Berths -	846,800

STAGE 2 BENEFITS

D29. The Stage 2 benefits are presented in this report for purposes of comparison of the 400-berth marina to the 360-berth marina. The Stage 2 document, July 1979, had four alternatives based on the 400-berth marina. The average annual benefits for the four alternatives, based on a 7-3/8 percent interest rate and a 50-year project life are shown in Table D14. The benefits were updated to October 1980 price levels by the entertainment component of the consumer price index. The average annual costs are also shown in Table D14. Net benefits are $138,800, $173,900, $253,400, and $319,400 for alternatives 1, 2, 3, and 4, respectively. The benefit-cost ratios,

average annual benefits to average annual costs, are 1.28, 1.38, 1.66, and 2.01 for alternatives 1, 2, 3, and 4, respectively, as shown on Table D14.

Table D14 - Economic Efficiency Criteria 1/ - Stage 2

	Average Annual Benefits 2/	Average Annual Costs 3/	Net Benefits	B/C Ratio
Alternative 1	636,200	497,400	138,800	1.28
Alternative 2	636,200	462,300	173,900	1.38
Alternative 3	636,200	382,800	253,400	1.66
Alternative 4	636,200	316,800	319,400	2.01

1/ Based on October 1980 price levels, 7-3/8 percent interest rate, and a 50-year project life.

2/ Does not include fishing benefits.

3/ Does not include self-liquidating cost for mooring area, launching ramps, and public service facilities.

RECREATIONAL FISHING BENEFITS

a. Introduction

D30. The fishing experience at Geneva-on-the-Lake includes both the catch for coolwater species like salmon, and the warmwater species of yellow perch, white bass, freshwater drum, channel catfish, smallmouth bass, and walleye. The coolwater species, salmon, is caught during the months of September and October. The warmwater species are caught year-round in the central basin of Lake Erie. The with project condition is the continuance of the shoreline fishing experience and the addition of the breakwater fishing experience. The without project condition is the shoreline fishing experience only. Benefits to the project are benefits for the new breakwater fishing experience. Benefits stem from providing more access to fishermen in terms of shoreline capability in the park and from greatly increasing the quality of fishing. Breakwall or jetty fishing provides significantly better fishing yields than does shoreline fishing.

b. Determination of Recreational Value

D31. To assist in assigning specific values for breakwater and shoreline fishing, a point rating method was used as specified in the Procedures for Evaluation of National Economic Development (NED) Benefits and Costs in Water Resources Planning, 14 December 1979. The method contains five specific criteria and associated measurement standards designed to reflect

quality, relative scarcity, ease of access, and aesthetic features of the area under consideration. These five specific criteria are; (a) recreational experience, (b) availability of opportunity, (c) carrying capacity, (d) accessibility, and (e) environmental quality. Each category of criteria contained a certain amount of possible points which it could allocate to the total aggregate number of points depending on to what degree the area under consideration met the evaluation criteria. For example, the point value of category a, "recreational experience," could range from 0-30 points. Categories b "availability of opportunity," c "carrying capacity," d "accessibility," and e "environmental," hold 0-18, 0-14, 0-18, and 0-20 points, respectively.

D32. All of the categories are evaluated from the standpoint of shoreline and breakwater fishing. Shoreline fishing occurs under without project conditions while breakwater fishing occurs under with project conditions. Values are derived for the shoreline fishing experience and the breakwater fishing experience. Category a, "recreational experience," earned eight points for the shoreline fishing recreation and 16 points for the breakwater fishing experience. Geneva-on-the-Lake offers a variety of general activities. Fishing, swimming, picnicking, camping, and hiking are recreational activities offered at the site. Recreational boating, a high-quality activity, will be provided under with project conditions. The with project conditions will also result in the enrichment of the fishing experience. Breakwater access provides a higher quality recreational experience than shoreline fishing. Breakwater fishing provides access to deeper water, larger concentration of fish, and a larger variety of species. The breakwaters also provide better fishermen access to yellow perch, a prominently sought species of the area. The yellow perch swim in schools so the breakwater interferes with their movement forcing them to swim around the breakwater. This makes them easily accessible to fishermen. The fish per angler hour also increases with breakwater fishing. The catch rate increases to allow the monetary value of the catch to increase.

D33. Category b dealt with the "nearness" of recreational sites offering some or all of the facilities at Geneva-on-the-Lake. The category was evaluated on the basis of the fishing experience. The shoreline fishing earned "0" points in this category while breakwater fishing earned "3" points. Shore fishing sites are scattered throughout the areas between Fairport and Ashtabula Harbors. There are public access sites for pier and breakwater fishing in the harbor development areas of Ashtabula and Fairport. Both are within a 30-minute traveling distance of Geneva-on-the-Lake State Park. Category c deals with the ability of the park's facilities to conduct recreation activities without detriment to the user's pleasure or to the environment. The shoreline fishing experience yields six points in this category while breakwater fishing yields nine points. The breakwater enhances the fishing experience and encourages increased participation. The provision of breakwater access will also be accompanied by provision of adequate parking facilities. Category d, "accessibility," judged the access to or within a certain recreational area. Both with and without project conditions were given 14 out of a possible 18 points. Geneva-on-the-Lake has a well-planned and developed network of roads to meet this criteria. Environmental quality, the final category, e, analyzes the aesthetic factors that might

influence the value of the recreational experience. The shoreline fishing experience earned seven points and breakwater fishing earned 10 points. Geneva-on-the-Lake is an aesthetically appealing area providing wooded camping and picnicking facilities. The site also has attractive nature areas and wetland areas. Water pollution, air pollution, pests, poor climate, and unsightly adjacent areas are not a problem at the park. Therefore, the park earns an above average rating for environmental quality. The breakwater provides a better habitat for fish than the clayey bank of the shoreline. The rough bottom surface of the breakwater provides fish with a place to congregate and feed on the crustaceans that live on the rough rock surface. The major species caught at Geneva, prefer the offshore rock rubble surface of the breakwater.

c. Total Recreational Values

D34. Geneva State Park garnered 35 points for the shoreline recreational fishing experience. The breakwater fishing experience earned 52 points out of a possible 80 points. The total points were then converted to a monetary value using the scale found in Table D15. The recreational value for the shoreline fishing experience is $2.18. Breakwater fishing yields a recreational value of $2.55 per fisherman. Salmon fishing has a higher recreational value as shown in Table D15. The shoreline salmon fishing experience has a value of $8.12 while the breakwater salmon fishing experience yields a value of $9.18.

d. Fishing Demand

D35. According to Table D3, total fishing demand on any given peak day was 14,500 for 1980 from Zone 1 and 493,970 in Zone 2. This significantly exceeds the 1980 annual fishing attendance at Geneva State Park. By 1985, the base year of the project, peak day demand is expected to reach 15,250 for Ashtabula County. There is sufficient demand to assure full utilization of the breakwater throughout the project life. It is expected that the shoreline fishing demand will increase at rates comparable to the Ashtabula County demand. The projections for the shoreline fishing experience are presented in Table D16 for the project evaluation period (1985-2035).

D36. The lineal feet of access for shoreline fishing is 7,500 feet along Lake Erie. Cowles Creek and streambanks within the park comprise 5,800 lineal feet, 2,200 feet of which are accessible for fishing. Pond A provides 1,000 feet of fishing access while Pond B yields 500 feet of fishing access. Total accessible land for shoreline fishing is 11,200 lineal feet. The project will provide 400 feet of breakwater at water depths of 2 feet or greater. The supply area will remain the same throughout the project life (1985-2035). A 275-day season is used to calculate the annual fishing days. The 275-day season, March through November, is broken down into 61 days of salmon fishing (consisting of 17 weekend days and 44 weekdays) and 214 general fishing days (consisting of 67 weekend days and 147 weekdays). A bad-weather day for fishing is any day when the precipitation exceeds .5 inches. The air temperature is not a deterrent since fishermen will participate in ice fishing. There are two weekend days and 11 weekdays lost to the general fishing season due to bad weather.

Table D15 - Conversion of Points to Dollar Values

Activity Category	0	10	20	30	40	50	60	70	80	90	100
	$	$	$	$	$	$	$	$	$	$	$
General Fishing and Hunting	1.57	1.74	1.90	2.07	2.28	2.51	2.73	2.94	3.06	3.17	3.20
Specialized Fishing and Hunting	7.50	7.69	7.88	8.08	8.27	9.03	9.80	10.57	11.34	12.10	12.87

Source: Principles and Standards, 14 December 1979.

Table D16 - Fishing Attendance Projections at Geneva State Park

Year	Attendance
1980	5,430
1990	5,920
2000	6,330
2010	6,710
2020	7,050
2030	7,400
2040	7,770

D37. The peak fishing season occurs during May through October and the nonpeak fishing occurs during the months of March, April, and November. Salmon fishing occurs during the months of September and October in the peak fishing season. The general fishing experience occurs during the peak and nonpeak seasons. There are 37 peak weekend days, 78 peak weekdays, 28 nonpeak weekend days, and 58 nonpeak weekdays for the general fishing experience as shown on Tables D17-D19.

D38. Design-day usage is found by utilizing the space standards of U. S. Fish and Wildlife. The breakwater fishing space standard is one fisherman per 10 feet of access. The shoreline fishing space standard is 60 feet of shoreline per fisherman. The instantaneous capacity for shoreline fishing, with 11,200 feet of access, is 187 fishermen. Applying a turnover rate of 2.0, as given in the Ohio Statewide Outdoor Recreation Plan, gives the maximum daily use for shoreline fishing, or 374 fishermen. The projected attendance for shoreline fishing is 5,680 in 1985 and 7,590 in 2035. Peak season participation for 54 peak days and 122 nonpeak days and nonpeak season participation for 28 peak days and 58 nonpeak days is determined on the basis of the 1985 and 2035 attendance projections. Peak season weekday demand is 10 percent of weekend demand. According to 1980 fishing attendance records at Geneva State Park, the fishing participation dropped by 75 percent during the nonpeak season. The nonpeak season weekend day yields 25 percent of the attendance expected on any given peak season weekend day. Nonpeak season weekdays have 10 percent of weekend demand. The following equation was used to derive the number of design day fishermen as shown on Tables D17-D19.

$$\text{Attendance} = 54X + 122\,X\,(10\%) + 28\,X\,(25\%) + 58\,X\,(10\%)(25\%)$$

D39. The design day capacity for breakwater fishing is determined by using the U. S. Fish and Wildlife Service space standard of one fisherman per 10 feet of access. The maximum daily usage for breakwater fishing, with 400 feet of access, is 80 fishermen. A turnover rate of 2.0, as given in the

Ohio SCORP, was used. The number of design day fishermen is given in Table D19. Nonpeak season participation for the breakwater fishing experience is also expected to fall by 75 percent.

e. Recreational Fishing Benefits

D40. The recreational value is determined for the peak fishing season and the nonpeak season for the general fishing experience. The value to shoreline fishing, shown in Tables D17 and D18 is determined for the years 1985 and 2035. The total recreational shoreline fishing value for 1985 is $22,300. Recreational value for shoreline fishing is $29,500 for the year 2035. The average annual recreational value for shoreline fishing is $24,200. The growth in recreational value from 1985-2035, $7,200, is discounted by the average annual equivalent factor for a 50-year project life, 50 years straight-line growth and a 7-3/8 percent interest rate, to yield a value of $1,900. The base year recreational value, $22,300 plus the discounted value of $1,900 yields an average annual recreational value of $24,200 for shoreline fishing. The value of breakwater fishing, shown in Table D19, is $26,600 annually. The peak weekend day value for the general fishing experience is $7,548. The number of days, 37, multiplied by the number of design day fishermen, 80, and the recreational value of $2.55 for the breakwater fishing experience yields a total recreational value of $7,548.

D41. The total recreational value for the with project condition is $50,800. This includes the average annual value for the shoreline and breakwater fishing experience. The without project condition, or th shoreline fishing experience, yields an average annual recreational value of $24,200. The benefits to the project is the difference between the with and without project recreational values. Recreational benefits for fishing at Geneva-on-the-Lake are $26,600.

SITE ATTRACTION FACTORS

D42. Geneva State Park offers a variety of recreational experiences. Hiking, swimming, and camping facilities are also available at the park. Many visitors may be attracted to the site because of the construction of the small-boat harbor. For example, an individual might want to spend half a day boating and half a day hiking. There is a loss of benefits to both boating and hiking activities under without project conditions. The small-boat harbor with project condition would result in additional benefits to the other activities the boater will enjoy while visiting Geneva State Park. The benefits for site attraction factors have not been evaluated since the percentage of visitors to Geneva State Park who will participate in two or more activities, has not been determined by an onsite survey. Although a dollar value has not been placed on these benefits, they are still important and should not be ignored.

Table D17 - Total Value Shoreline Recreational Fishing - 1985

Access (ft)	Fishermen	Turnover Rate	(1) No. of Design Day Fishermen	(2) No. of Days	(3) Recreational Value	(4) Total (1) X (2) (3)
					$	$
11,200	187	2.0	76 1/	37 1/	2.18	6,130
			8 2/	78 2/	2.18	1,360
			76 3/	17 3/	8.12	10,491
			8 4/	44 4/	8.12	2,858
			19 5/	28 5/	2.18	1,160
			2 6/	58 6/	2.18	253
						22,300

1/ Peak weekend day for general fishing.

2/ Peak weekday for general fishing.

3/ Peak weekend day for salmon fishing.

4/ Peak weekday for salmon fishing.

5/ Nonpeak weekend day for general fishing.

6/ Nonpeak weekday for general fishing.

Table D18- Total Value Shoreline Recreational Fishing - 2035

Access (ft)	Fishermen	Turnover Rate	(1) No. of Design Day Fishermen	(2) No. of Days	(3) Recreational Value	(4) Total (1) X (2) X (3)
					$	$
11,200	187	2.0	102 1/	37 1/	2.18	8,227
			10 2/	78 2/	2.18	1,700
			102 3/	17 3/	8.12	14,080
			10 4/	44 4/	8.12	3,573
			26 5/	28 5/	2.18	1,587
			3 6/	58 6/	2.18	379
						29,546 say 29,500

1/ Peak weekend day for general fishing.

2/ Peak weekday for general fishing.

3/ Peak weekend day for salmon fishing.

4/ Peak weekday for salmon fishing.

5/ Nonpeak weekend day for general fishing.

6/ Nonpeak weekday for general fishing.

Table D19- Total Value Breakwater Recreational Fishing - 2035

Access (ft)	Fishermen	Turnover Rate	No. Day	(1) of Design Fishermen	(2) No. of Days	(3) Recreational Value	(4) Total (1) X (2) X (3)
						$	$
400	40	2.0		80 1/	37 1/	2.55	7,548
				8 2/	78 2/	2.55	1,591
				80 3/	17 3/	9.18	12,485
				8 4/	44 4/	9.18	3,231
				20 5/	28 5/	2.55	1,428
				2 6/	58 6/	2.55	296
							26,579 say 26,600

1/ Peak weekend day for general fishing.

2/ Peak weekday for general fishing.

3/ Peak weekend day for salmon fishing.

4/ Peak weekday for salmon fishing.

5/ Nonpeak weekend day for general fishing.

6/ Nonpeak weekday for general fishing.

SUMMARY OF STAGE 3 BENEFITS - OCTOBER 1980 PRICE LEVELS

D43. The project benefits include recreational navigation, harbor-of-refuge, and recreational fishing benefits as shown on Table D20. The total recreational navigation benefits for the 2.5 and 3.0 persons per boat standards are $824,900. Both the 2.5 persons per boat and the 3.0 persons per boat standards yield harbor-of-refuge and recreational fishing benefits of $21,300 and $26,600, respectively. The total benefits for the project are $872,800 for the 2.5 and 3.0 persons per boat assumptions. The 3.5 and 4.0 persons per boat assumptions yield average annual benefits of $873,400, including recreational navigation benefits of $825,500, harbor-of-refuge benefits of $21,300 and recreational fishing benefits of $26,600.

TOTAL PROJECT COSTS - OCTOBER 1980 PRICE LEVELS

D44. The cost estimate for the 360-berth marina (Plan 3b) is presented in Table D21. The total first costs and annual charges for navigation and recreational fishing are based on a 7-3/8 percent interest rate and a 50-year project life. Total first costs of investment are $6,228,600 for alternative 3b. Total project annual charges are $573,200, of which $313,500 are Federal and $259,700 are non-Federal.

ECONOMIC EFFICIENCY

D45. Three measures of economic efficiency were developed for the proposed project. They are the benefit-cost ratio, net discounted benefits, and the payback period. The project plan is evaluated for a 2.5, 3.0, 3.5, and 4.0 persons per boat assumption. There is sufficient demand with all assumptions to assure full utilization of the 360-berth marina in 1985.

D46. The benefit-cost ratio is the ratio of the average annual benefits to the average annual costs. The project benefit-cost ratio is 1.5 for 2.5 and 3.0 persons per boat as shown on Table D22. The 3.5 and 4.0 persons per boat also have a project benefit-cost ratio of 1.5.

D47. Net discounted benefits are the present value of benefits in excess of project costs. They are $299,600 for the 2.5 and 3.0 persons per boat standards. The 3.5 and 4.0 persons per boat standards yield $300,200 in net discounted benefits.

D48. The project payback period is the number of years it takes for the undiscounted annual benefits to equal project costs as shown on Table D22. The project payback period is 7 years for the 2.5 3.0, 3.5, and 4.0 persons per boat standards.

Table D20 - Summary of Benefits

Benefits	Alternative 3b 2.5 Persons Per Boat	3.0 Persons Per Boat
	$	$
Recreational Navigation		
New	693,200	693,200
Trailered	66,300	66,300
Transient	65,400	65,400
Total	824,900	824,900
Harbor-of-Refuge	21,300	21,300
Recreational Fishing	26,600	26,600
Total	872,800	872,800

Table D21 - Total Project Costs - Geneva-on-the-Lake 1/
Alternative 3b

Item	Federal			Non-Federal 2/			Total 2/		
	Navigation	Recreational: Fishing	Total	Navigation	Recreational: Fishing	Total	Navigation	Recreational: Fishing	Total
First Cost	2,674,000	36,000	2,710,000	2,604,000	36,000	2,640,000	5,278,000	72,000	5,350,000
Interest During Construction	197,200	2,700	199,900	192,000	2,700	194,700	389,200	5,400	394,600
Total Investment Cost	2,871,200	38,700	2,909,900	2,796,000	38,700	2,834,700	5,667,200	77,400	5,744,600
Lands and Damages	0	0	0	484,000	0	484,000	484,000	0	484,000
Total Project Costs	2,871,200	38,700	2,909,900	3,280,000	38,700	3,318,700	6,151,200	77,400	6,228,600
Annual Charges									
Interest	211,700	2,900	214,600	241,900	2,900	244,800	453,600	5,800	459,400
Amortization	6,200	100	6,300	7,100	100	7,200	13,300	200	13,500
Maintenance	92,600	0	92,600	5,900	1,800	7,700	98,500	1,800	100,300
Total	310,500	3,000	313,500	254,900	4,800	259,700	565,400	7,800	573,200

1/ Based on October 1980 price levels, 7-3/8 percent interest rate, and a 50-year economic life.

2/ Does not include self-liquidating cost for mooring area, launching ramps, and public service facilities currently estimated at $5,920,000 (October 1980 price levels).

Table D22 - Economic Efficiency 1/

Item	Investment Cost	Average Annual Benefits	Average Annual Costs	B/C Ratio	Net Discounted Benefits	Payback Period
	$	$	$		$	
2.5 Persons Per Boat						
Recreational Navigation	6,151,200	846,200	565,400	1.50	280,800	-
Recreational Fishing	77,400	26,600	7,800	3.41	18,800	-
Total	6,228,600	872,800	573,200	1.52	299,600	7 years
3.0 Persons Per Boat						
Recreational Navigation	6,151,200	846,200	565,400	1.50	280,800	-
Recreational Fishing	77,400	26,600	7,800	3.41	18,800	-
Total	6,228,600	872,800	573,200	1.52	299,600	7 years

1/ Given a 7-3/8 percent interest rate, 50-year project life, October 1980 price levels.

SUMMARY OF STAGE 3 BENEFITS - AUGUST 1981 PRICE LEVELS

D49. The project benefits of recreational navigation, harbor-of-refuge, and recreational fishing have been updated to August 1981 price levels, as shown on Table D23. The total recreational navigation benefits are $873,400 for the 2.5 and 3.0 persons per boat standards. The harbor-of-refuge benefits and the recreational fishing benefits are $22,600 and $28,200, respectively, for the 2.5 and 3.0 persons per boat assumptions. The total project benefits, given August 1981 price levels, are $924,200 for the 2.5 and 3.0 persons per boat standards. The 3.5 and 4.0 persons per boat standards have total project benefits of $924,800. This includes average annual recreational navigation benefits of $874,000, harbor-of-refuge benefits of $22,600, and recreational fishing benefits of $28,200.

TOTAL PROJECT COSTS - AUGUST 1981 PRICE LEVELS

D50. The cost estimate for alternative 3b on August 1981 price levels are displayed in Table D24. The total first costs and annual charges for recreational navigation and recreational fishing are based on a 7-3/8 percent interest rate and a 50-year project life. The total first costs of investment are $6,652,000 for recreational navigation and $86,000 for recreational fishing. Total first investment costs for alternative 3b are $6,738,000. Annual charges are $620,600 for the project including $340,900 in Federal costs and $279,700 in non-Federal costs.

ECONOMIC EFFICIENCY

D51. The measures of project efficiency are the benefit-cost rato, net discounted benefits, and the payback period. The 2.5, 3.0, 3.5, and 4.0 persons per boat standard assumptions are evaluated against the project plan as shown in Table D25.

D52. The benefit-cost ratio is the ratio of average annual benefits to average annual costs. The 2.5, 3.0, 3.5, and 4.0 persons per boat standards yield a benefit-cost ratio of 1.5.

D53. Net discounted benefits are average annual benefits less average annual costs. The net discounted benefits are $303,600 for the 2.5 and 3.0 persons per boat standards. Both the 3.5 and 4.0 persons per boat standard yield project net discounted benefits of $304,200.

D54. The project payback period is the number of years it takes for the undiscounted annual benefits to equal project costs as shown in Table D25. The project payback period is 7 years for the 2.5, 3.0, 3.5, and 4.0 persons per boat assumptions.

Table D23 - Summary of Benefits

Benefits	Alternative 3b: 2.5 Persons Per Boat	Alternative 3b: 3.0 Persons Per Boat
	$	$
Recreational Navigation		
New	734,000	734,000
Trailered	70,200	70,200
Transient	69,200	69,200
Total	873,400	873,400
Harbor-of-Refuge	22,600	22,600
Recreational Fishing	28,200	28,200
Total	924,200	924,200

Table D24 - Estimate of Annual Charges 1/
Alternative 3b

Item	Federal: Navigation	Federal: Recreational Fishing	Federal: Total	Non-Federal 2/: Navigation	Non-Federal 2/: Recreational Fishing	Non-Federal 2/: Total	Total 2/: Navigation	Total 2/: Recreational Fishing	Total 2/: Total
	$	$	$	$	$	$	$	$	$
First Cost	2,906,000	40,000	2,946,000	2,830,000	40,000	2,870,000	5,736,000	80,000	5,816,000
Interest During Construction	214,300	3,000	217,300	208,700	3,000	211,700	423,000	6,000	429,000
Total Investment Cost	3,120,300	43,000	3,163,300	3,038,700	43,000	3,081,700	6,159,000	86,000	6,245,000
Lands and Damages	0	0	0	493,000	0	493,000	493,000	0	493,000
Total Project Costs	3,120,300	43,000	3,163,300	3,531,700	43,000	3,574,700	6,652,000	86,000	6,738,000
Annual Charges									
Interest	230,100	3,200	233,300	260,400	3,200	263,600	490,500	6,400	496,900
Amortization	6,700	100	6,800	7,600	100	7,700	14,300	200	14,500
Maintenance	100,800	0	100,800	6,400	2,000	8,400	107,200	2,000	109,200
Total	337,600	3,300	340,900	274,400	5,300	279,700	612,000	8,600	620,600

1/ Based on August 1981 price levels, 7-3/8 percent interest rate, and a 50-year economic life.

2/ Does not include self-liquidating cost for mooring area, launching ramps, and public service facilities.

Table D25 - Economic Efficiency

Item	Investment Cost	Average Annual Benefits	Average Annual Costs	B/C Ratio	Net Discounted Benefits	Payback
	$	$	$		$	
		2.5 Persons Per Boat				
Recreational Navigation	6,652,000	896,000	612,000	1.46	284,000	-
Recreational Fishing	86,000	28,200	8,600	3.28	19,600	-
Total	6,738,000	924,200	620,600	1.49	303,600	7 years
		3.0 Persons Per Boat				
Recreational Navigation	6,652,000	896,000	612,000	1.46	284,000	-
Recreational Fishing	86,000	28,200	8,600	3.28	19,600	-
Total	6,738,000	924,200	620,600	1.49	303,600	7 years

APPENDIX E

PERTINENT CORRESPONDENCE

GENEVA-ON-THE-LAKE SMALL-BOAT HARBOR

FINAL REFORMULATION PHASE I GENERAL DESIGN MEMORANDUM

U. S. Army Engineer District, Buffalo
1776 Niagara Street
Buffalo, NY 14207

APPENDIX E

PERTINENT CORRESPONDENCE

Exhibit E-1	10 November 1977 letter from Dr. Teater of ODNR to Buffalo District Engineer regarding ODNR's intent to furnish the items of local cooperation as presented in House Document No. 91-402.
Exhibit E-2	16 March 1972 letter from Mr. Fred Wampler of ODNR to Buffalo District Acting Chief, Engineering Division stating ODNR's intention to provide assistance to local communities for their share of the financial support of the Geneva-on-the-Lake project.
Exhibit E-3	24 July 1969 letter from Director Moor of ODNR to Buffalo District Engineer regarding ODNR's intent to furnish the items of local cooperation as presented in the 1969 Interim Report.
Exhibit E-4	4 December 1980 letter from Ms. Barbara J. Taylor of the U. S. Environmental Protection Agency to Buffalo District Engineer regarding the Public Notice and Preliminary Section 404 Evaluation for a Small-Boat Harbor at Geneva-on-the-Lake, Ashtabula County, Ohio, dated 30 October 1980.
Exhibit E-5	9 October 1980 letter from Mr. James C. Gritman of the U. S. Fish and Wildlife Service to Buffalo District Deputy Engineer regarding the potential impact to Federally listed Threatened or Endangered Species as a result of the proposed small-boat harbor project at Geneva-on-the-Lake, Ashtabula County, Ohio.
Exhibit E-6	10 July 1980 letter from Buffalo District Chief, Engineering Division, to Commander, Ninth Coast Guard District requesting that they define the required aids to navigation and estimate the construction and annual maintenance costs for these aids for the Geneva-on-the-Lake, Ohio small-boat harbor project.
Exhibit E-7	21 August 1980 letter from Mr. R. W. Gasior of the Ninth Coast Guard District to Buffalo District Engineer defining the required aids to navigation and their estimated construction and annual maintenance costs for the Geneva-on-the-Lake, Ohio small-boat harbor project.
Exhibit E-8	21 October 1980 letter from Mr. Charles C. Calhoun, Jr., of Waterways Experiment Station, Corps of Engineers, to Buffalo District Chief, Engineering Division regarding the feasibility of wetland habitat development at Geneva State Park.

Exhibit E-9	12 January 1981 telephone conversation record beween Buffalo District and Mr. Hugh Thomas regarding proposed harbor development at Ashtabula, Ohio.
Exhibit E-10	13 June 1979 letter from Buffalo District Engineer to James Swartzmiller of ODNR presenting Buffalo District's interpretation of Executive Order 11990 as it relates to evaluation of practical alternatives for the Geneva-on-the-Lake Small-Boat Harbor Study. (NOTE: Similar letter sent to Conrad A. Fjetland of the U. S. Fish and Wildlife Service).
Exhibit E-11	2 July 1979 letter from Conrad Fjetland of the U. S. Fish and Wildlife Service stating that agency's position on further consideration of the four structural plans for the small-boat harbor.
Exhibit E-12	6 July 1979 letter from Conrad Fjetland of the U. S. Fish and Wildlife Service modifying his letter of 2 July 1979 (Exhibit E-8).
Exhibit E-13	17 July 1979 letter from James Swartzmiller of Ohio Department of Natural Resources indicating that agency's preference for Plan 3.
Exhibit E-14	29 May 1980 letter from Dr. Teater of ODNR to Buffalo District Engineer regarding the results of a meeting between ODNR and the U. S. Fish and Wildlife Service for the Geneva-on-the-Lake Small-Boat Harbor Study.
Exhibit E-15	15 April 1981 letter from Dr. Teater of ODNR to Buffalo District Engineer regarding ODNR's intent to furnish the additional items of local cooperation required for mitigation of adverse environmental impacts.
Exhibit E-16	22 October 1980 letter from Mr. James A. Swartzmiller of ODNR to Buffalo District Engineer presenting a preliminary roadway and parking plan for Alternative Harbor Plan 3b and the marina facilities they are proposing to construct.
Exhibits E-17 to E-21	Comments/Responses on the Draft Reformulation Phase I General Design Memorandum and Draft Environmental Impact Statement.

ODNR

Ohio Department of Natural Resources

Fountain Square · Columbus, Ohio 43224 · (614) 466-3770

November 10, 1977

COL Daniel D. Ludwig, District Engineer
U. S. Army Engineer District, Buffalo
1776 Niagara Street
Buffalo, New York 14207

Dear Colonel Ludwig:

Reference is made to your letter of 28 September 1977 and to our subsequent meeting of 31 October 1977 concerning the proposed harbor of refuge for Geneva State Park at Lake Erie.

Your 28 September letter expresses two basic concerns which you have noted may delay the schedule for completion of advanced engineering and design for the proposed project.

The first concern relates to the location of a dock channel and maneuvering area as originally proposed. The land where these facilities were to be located now is occupied by a parking area that was constructed by this department to serve the beach at Geneva State Park. In this regard, I have been advised by my Office of the Chief Engineer that the location of the parking area was coordinated with your office at the time of construction. It is my understanding that this presented no problems at the time in that the dock channel and maneuvering area would have to be relocated for the small boat harbor project, but that the necessary relocation would not present significant difficulties.

Your second concern relates to the State's ability to provide the non-federal assurances as presented in House Document No. 91-402. We have reviewed these items of local cooperation and based upon the funding currently contained in our capital improvements appropriation we wish to reiterate the intent of the Ohio Department of Natural Resources to provide such assurances.

After reviewing your 28 September correspondence and having the opportunity to discuss this matter with you on 31 October, I wish, at this time, to express my concern over your estimated three years to complete preconstruction planning.

EXHIBIT E-1

COL Daniel D. Ludwig, District Engineer
Page Two
November 10, 1977

This project is of vital importance to the many boaters who navigate the Lake Erie waters off the shores of Geneva State Park. Congress recognized the need for the project and provided appropriate authorization almost eight years ago, and advanced engineering and design is just now beginning. Therefore, I am requesting that every consideration be given to shortening the estimated time schedule to complete preconstruction planning to two years in lieu of the three years that is presently proposed.

Sincerely,

Robert W. Teater

ROBERT W. TEATER
Director

RWT:gfs

JHN J. GILLIGAN
GOVERNOR

WILLIAM B. NYE
DIRECTOR

STATE OF OHIO
DEPARTMENT OF NATURAL RESOURCES
OHIO DEPARTMENTS BUILDING
COLUMBUS 43215

March 16, 1972

Mr. Joseph G. Weinrub
Acting Chief, Engineering Division
U. S. Army Engineer District, Buffalo
1776 Niagara Street
Buffalo, New York 14207

Small-Boat Harbor Reports
Coast of Lake Erie

Dear Mr. Weinrub:

Reference is made to your letter of February 11, 1972 to S. L. Frost requesting our comments with regard to the small-boat harbor reports listed hereunder:

a. Lorain Harbor
b. Avon-on-the-Lake
c. Chagrin River
d. Fairport Harbor
e. Geneva-on-the-Lake State Park
f. Ashtabula Harbor
g. Conneaut Harbor

The listed localities have been reviewed by the Division of Watercraft and our engineering and planning sections, agencies within our department with specific interest in these projects. Based upon the results of this review, it is the position of the Ohio Department of Natural Resources to support the initiation of the studies for Avon-on-the-Lake and Lorain Harbor. We also wish to provide our support for the construction of the projects as authorized for Geneva-on-the-Lake State Park, Chagrin River, and Conneaut Harbor. Furthermore, this letter is to serve as our concurrence for the draft report for Fairport Harbor and the preliminary planning for Ashtabula Harbor.

In regard to non-Federal financial support, it is our intent to provide, when necessary and subject to availability of funds, assistance to the local communities for their share in completion of the projects.

It is hoped that the information provided in the preceding paragraphs will help "clear up" any questions concerning Department of Natural Resources support for the listed harbors of refuge.

EXHIBIT E-2

We appreciate the opportunity to provide our comments and trust that you will not hesitate to call upon us in the event you should have any questions regarding our position.

Sincerely,

Fred Wampler

Fred Wampler
State-Federal Coordinator

FW:bg

cc: S. L. Frost

JAMES A. RHODES
GOVERNOR

FRED E. MORR
DIRECTOR

STATE OF OHIO
DEPARTMENT OF NATURAL RESOURCES
OHIO DEPARTMENTS BUILDING
COLUMBUS 43215

July 24, 1969

Colonel Ray S. Hansen
District Engineer
U. S. Army Engineer District, Buffalo
1776 Niagara Street
Buffalo, New York 14207

Geneva-on-the-Lake -
Improvements for Small Boat Navigation

Dear Colonel Hansen:

Reference is made to your survey report on improvements for small boat navigation at Geneva-on-the-Lake and the Division Engineer's public notice dated 2 May 1969 regarding the report and the recommended project.

Due to the critical shortage of recreational facilities in this part of our state the Department of Natural Resources has acquired 465 acres at Geneva-on-the-Lake at a cost of $1, 146, 000 for this project as well as other improvements for general recreation. The Department is presently finishing a construction contract for $1, 000, 000 which will provide a swimming beach and bathhouse with showers and lockers, picnic and play areas with shelters and restrooms, and parking facilities for 2, 100 automobiles. In addition to these facilities we have programmed for the next biennium the development of a camping area with 300 sites for tents and trailers, construction of 30 vacation cabins and development of a marina for recreational craft at an estimated cost of $3, 600, 000.

As the result of our review of the survey report we find the plan of development acceptable and in keeping with the general recreation master plan for Geneva State Park. However, due to the concurrent development at the site it may be necessary to make certain minor adjustments during the advance engineering and design phase of the project.

EXHIBIT E-3

Under the authority granted the Director of the Department of Natural Resources in Section 1501.02, Ohio Revised Code, I will furnish the non-Federal assurances for items "a" and "c" through "k", inclusive, as indicated on pages 27 and 28 of the survey report. Insofar as the Ohio constitutional and statutory authorities provide, assurances for item "b" will also be furnished.

In view of the urgent need for this small boat navigation project to be developed concurrently with the state recreation development at Geneva State Park, it is hoped that authorization and funding for this improvement at Geneva-on-the-Lake for small boat navigation will receive early and favorable consideration by the Congress.

Sincerely,

Fred E. Morr

FRED E. MORR,
Director

FEM:bg

UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY
REGION V
230 SOUTH DEARBORN ST
CHICAGO ILLINOIS 60604

REPLY TO ATTENTION OF

4 DEC 1980

Colonel George P. Johnson
District Engineer
U.S. Army Engineer District, Buffalo
1776 Niagara Street
Buffalo, New York 14207

Dear Colonel Johnson:

This letter concerns the Public Notice and Preliminary Section 404 Evaluation for a Small - Boat Harbor at Geneva-On The Lake, Ashtabula County, Ohio dated 30 October 1980.

We have called Mr. Robert Klips of your staff and discussed the necessity of a site visit on the project and the need for additional information. We expect to be able to participate in a site visit by the end of January 1981, and will be contacting your office again to make arrangements. Our comments on the project will be delayed until the site visit is completed.

Please contact Rick Pitorak of my staff at 312/886-6689 for any further matters relevant to this project.

Sincerely yours,

Barbara J. Taylor

Barbara J. Taylor, Chief
Environmental Impact Review Staff
Office of Environmental Review

EXHIBIT E-4

United States Department of the Interior
FISH AND WILDLIFE SERVICE
Federal Building, Fort Snelling
Twin Cities, Minnesota 55111

IN REPLY REFER TO:

AFF-SE

OCT 9 1980

LTC Thomas R. Braun
Deputy District Engineer
U.S. Army Engineer District
1776 Niagara Street
Buffalo, New York 14207

Dear Colonel Braun:

This letter responds to your September 17, 1980 request for information (NCBED-PE) regarding the proposed small boat harbor project at Geneva-on-the-Lake, Ashtabula County, Ohio and potential impact to the Federally listed Threatened or Endangered Species.

A review of the Fish and Wildlife Service (FWS) "Red Book of Endangered Species" in the North Central Region, indicates that the following listed species occur within Ashtabula county:

Indiana Bat (E) (Myotis sodalis)
Bald Eagle (E) (Haliaeetus leucocephalus)

Although listed in Ashtabula county, a recent conversation with Denis Case, Ohio Department of Natural Resources, indicated that neither species occurs at or near the project location. Therefore, impact to both species is anticipated to be minor.

This precludes the need for consultation on this project as required under Section 7 of the Endangered Species Act of 1973, as amended.

If we can be of further assistance, please advise.

Sincerely yours,

James C. Gritman

James C. Gritman
Acting Regional Director

EXHIBIT E-5

NCBED-PW 10 July 1980

SUBJECT: Geneva-on-the-Lake, Ohio Small-Boat Harbor Study - Required Aids to Navigation

Commander
North Coast Guard District
1240 East Ninth Street
Cleveland, OH 44199

1. The Buffalo District recently initiated Stage 3 planning for the Geneva-on-the-Lake, Ohio, Small-Boat Harbor Phase I General Design Memorandum (GDM) investigation. The purpose of this investigation is to determine the feasibility of providing a small-boat harbor and harbor-of-refuge and recreational fishing facilities as an integral part of Geneva State Park. Geneva State Park is located about 17 miles east of Fairport Harbor, Ohio, and 12 miles west of Ashtabula Harbor, Ohio. (See Inclosure 1)

2. The Geneva-on-the-Lake Small-Boat Harbor Study involves reformulation of the project plan authorized under Section 201 of the 1965 Flood Control Act (Public Law 89-298) by the House and Senate Committees on Public Works by Resolutions dated 15 December 1970 and 17 December 1970, respectively. The authorized project plan is shown on Inclosure 2.

3. The investigation to date has indicated that Alternative Plan No. 3 (Inclosure 3) is the preferred harbor alternative and warrants additional detailed study. This additional study consists primarily of modifying the location of the mooring areas to conform to the Ohio Department of Natural Resources' (the local sponsor) marina master plan. Modifications to the arrowhead breakwaters and the entrance channel are not anticipated at this time.

4. It is requested that you review Alternative Plan No. 3, define the required aids to navigation, and estimate the construction and annual maintenance costs for these aids. In addition, in order to include this information in the Draft Phase I GDM report, it is also requested that this information be provided by 25 August 1980.

EXHIBIT E-6

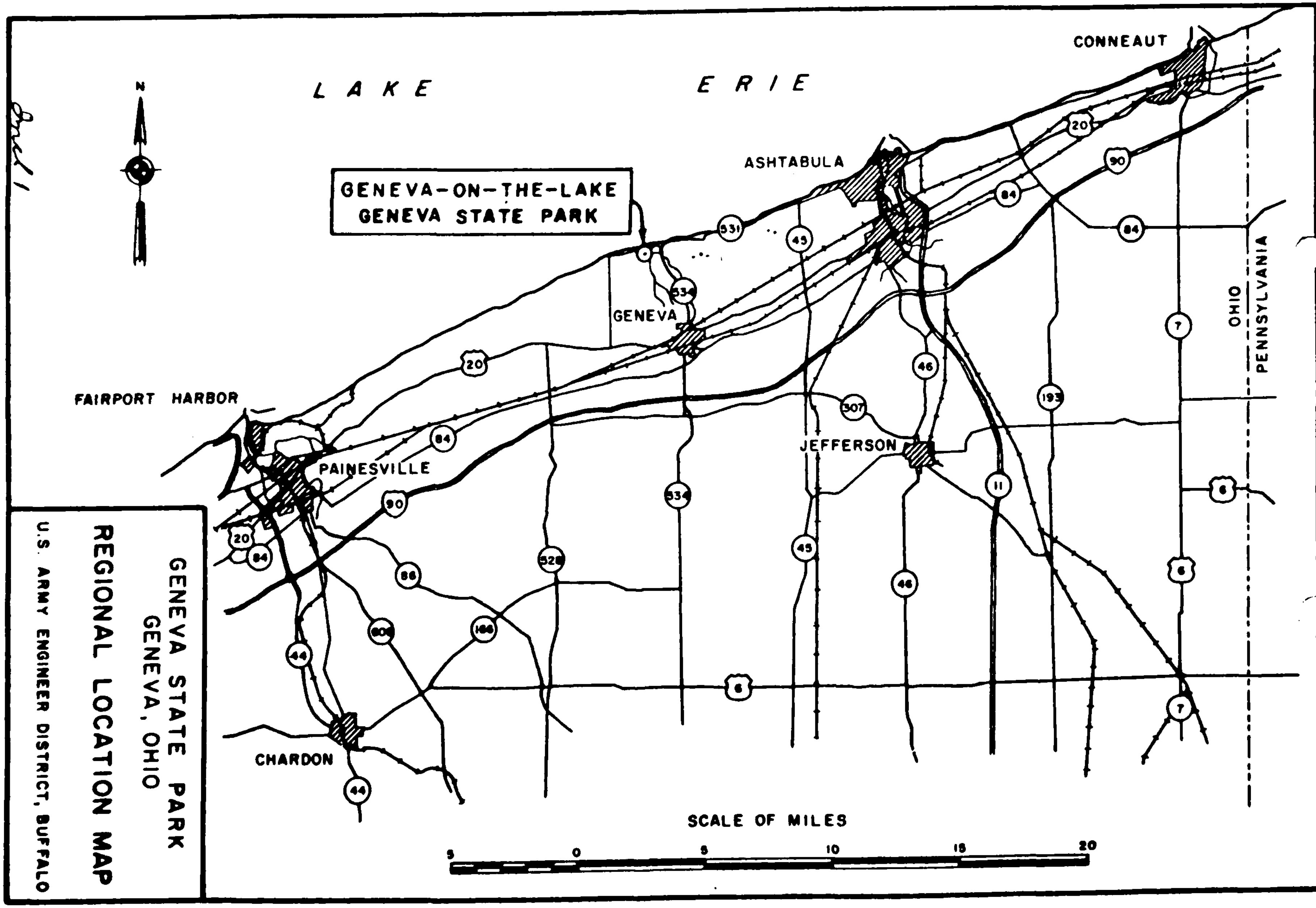
NCBED-PW
SUBJECT: Geneva-on-the-Lake, Ohio Small-Boat Harbor Study - Required
Aids to Navigation

5. Inclosure 4 is a copy of the recently completed Stage 2 Document for this project. If you have any questions regarding this request, the proposed plan or the Stage 2 Document, please contact Mr. Richard Aguglia, the Project Manager for this study, at (FTS) 473-2263.

FOR THE DISTRICT ENGINEER:

4 Incl
as

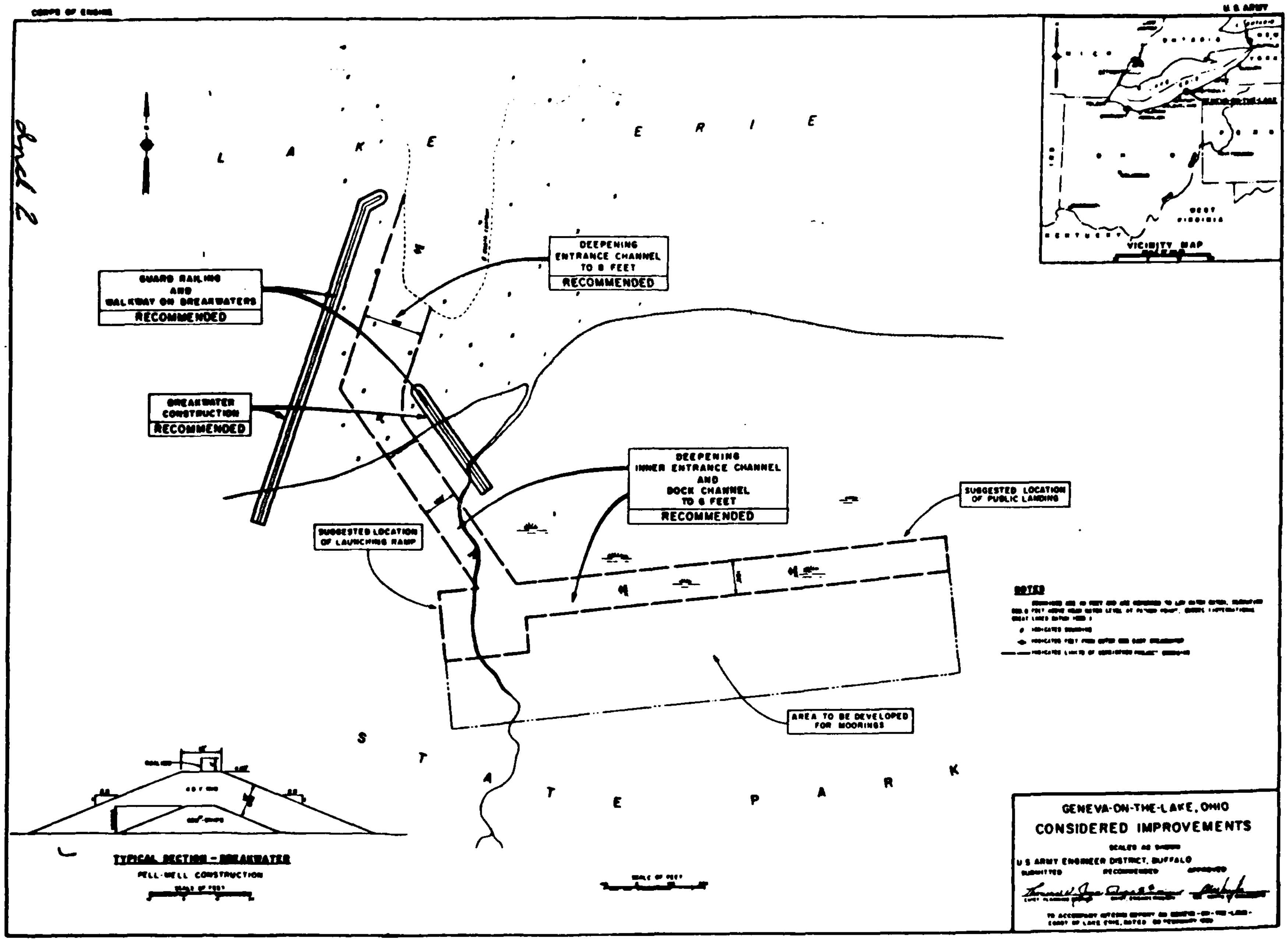
DONALD M. LIDDELL
Chief, Engineering Division

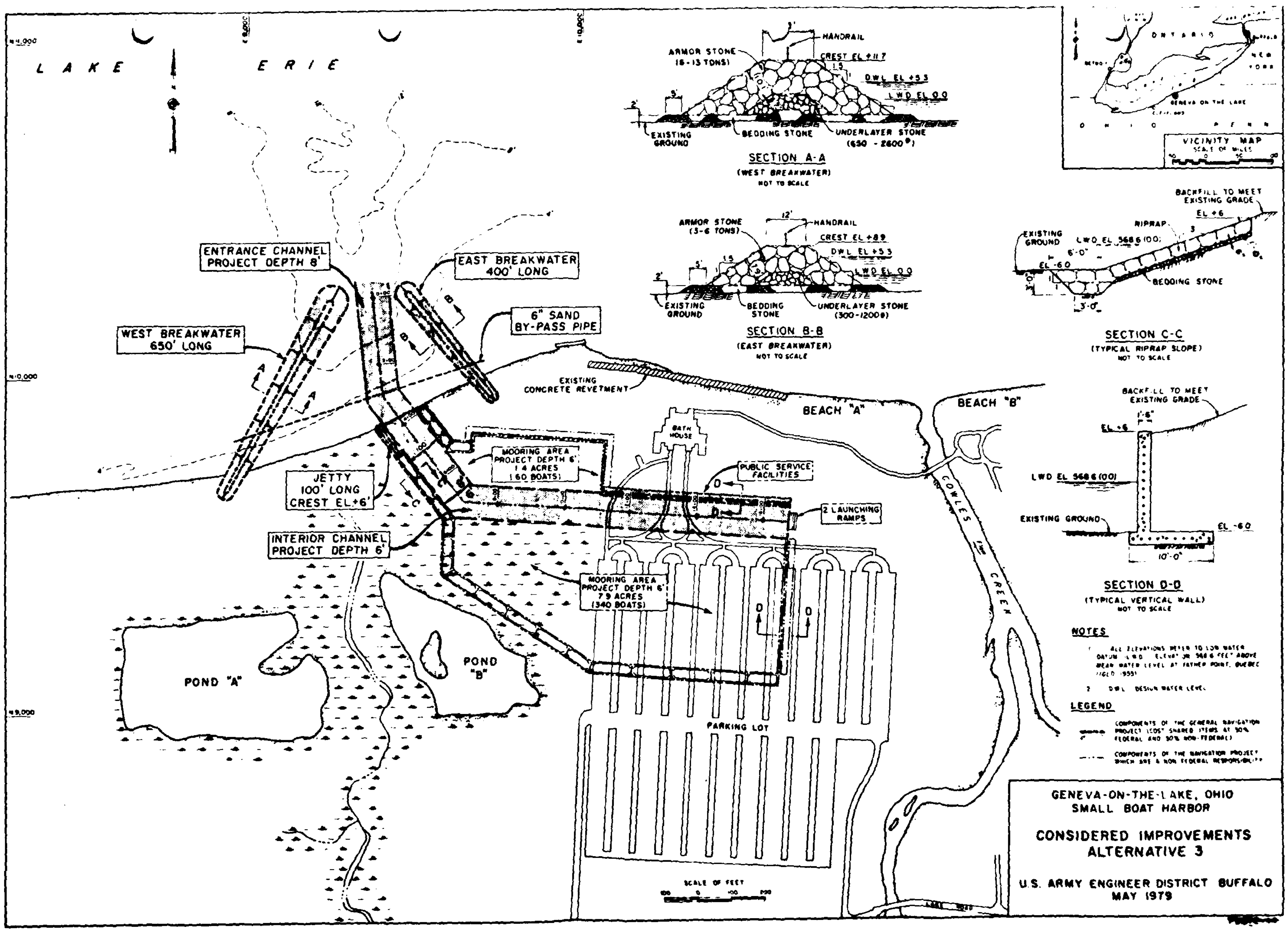


GENEVA STATE PARK
GENEVA, OHIO

REGIONAL LOCATION MAP

U.S. ARMY ENGINEER DISTRICT, BUFFALO


CORPS OF ENGINEERS
U.S. ARMY
LAKE ERIE
STATE PARK
DEEPENING
ENTRANCE CHANNEL
TO 8 FEET
RECOMMENDED
GUARD RAILING
AND
WALKWAY ON BREAKWATERS
RECOMMENDED
BREAKWATER
CONSTRUCTION
RECOMMENDED
DEEPENING
INNER ENTRANCE CHANNEL
AND
DOCK CHANNEL
TO 6 FEET
RECOMMENDED
SUGGESTED LOCATION
OF PUBLIC LANDING
SUGGESTED LOCATION
OF LAUNCHING RAMP
AREA TO BE DEVELOPED
FOR MOORINGS
NOTES
VICINITY MAP
WEST VIRGINIA
KENTUCKY
TYPICAL SECTION - BREAKWATER
CELL-WELL CONSTRUCTION
GENEVA-ON-THE-LAKE, OHIO
CONSIDERED IMPROVEMENTS
U.S. ARMY ENGINEER DISTRICT, BUFFALO
SUBMITTED
RECOMMENDED
APPROVED
Incl 2



LAKE ERIE
ENTRANCE CHANNEL PROJECT DEPTH 8'
EAST BREAKWATER 400' LONG
WEST BREAKWATER 650' LONG
6" SAND BY-PASS PIPE
EXISTING CONCRETE REVETMENT
BEACH "A"
BEACH "B"
BATH HOUSE
MOORING AREA PROJECT DEPTH 6' 1.4 ACRES (60 BOATS)
PUBLIC SERVICE FACILITIES
2 LAUNCHING RAMPS
JETTY 100' LONG CREST EL+6'
INTERIOR CHANNEL PROJECT DEPTH 6'
MOORING AREA PROJECT DEPTH 6' 7.9 ACRES (340 BOATS)
POND "A"
POND "B"
PARKING LOT
COWLES CREEK
SCALE OF FEET
HANDRAIL
ARMOR STONE (6-13 TONS)
CREST EL +11.7
DWL EL +5.3
LWD EL 0.0
EXISTING GROUND
BEDDING STONE
UNDERLAYER STONE (650 - 2600#)
SECTION A-A
(WEST BREAKWATER)
NOT TO SCALE
ARMOR STONE (3-6 TONS)
CREST EL +8.9
DWL EL +5.3
LWD EL 0.0
EXISTING GROUND
BEDDING STONE
UNDERLAYER STONE (300-1200#)
SECTION B-B
(EAST BREAKWATER)
NOT TO SCALE
VICINITY MAP
ONTARIO
NEW YORK
OHIO
PENN
GENEVA ON THE LAKE
BACKFILL TO MEET EXISTING GRADE
EL +6
RIPRAP
EXISTING GROUND
LWD EL 568.6 (0.0)
EL -6.0
BEDDING STONE
SECTION C-C
(TYPICAL RIPRAP SLOPE)
NOT TO SCALE
BACKFILL TO MEET EXISTING GRADE
EL +6
LWD EL 568.6 (0.0)
EXISTING GROUND
EL -6.0
10'-0"
SECTION D-D
(TYPICAL VERTICAL WALL)
NOT TO SCALE
NOTES
2. DWL DESIGN WATER LEVEL
LEGEND
GENEVA-ON-THE-LAKE, OHIO
SMALL BOAT HARBOR
CONSIDERED IMPROVEMENTS
ALTERNATIVE 3
U.S. ARMY ENGINEER DISTRICT BUFFALO
MAY 1979

Incl 3

DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

Address reply to:
COMMANDER (oan)
Ninth Coast Guard District
1240 East 9th St.
Cleveland, Ohio 44199
Phone: (216)522-3991

16517
Ser 253
21 August 1980

From: Commander, Ninth Coast Guard District
To: District Engineer, Buffalo District, U. S. Army Corps of Engineers
1776 Niagara Street, Buffalo, New York 14207

Subj: Geneva-on-the-Lake, Ohio Small Boat Harbor Study

Ref: (a) Buffalo Corps of Engineers ltr NCBED-PW dtd 10 Jul 80

1. The proposed plan will require establishment of a light at the outer end of each breakwater. Both lights will be battery operated and mounted on our standard 20 foot pole structure. Construction cost per light is estimated at $35,000. Annual maintenance cost is approximately $400 each.

R. W. Gasior

R. W. GASIOR
By direction

EXHIBIT E-7

DEPARTMENT OF THE ARMY
WATERWAYS EXPERIMENT STATION, CORPS OF ENGINEERS
P. O. BOX 631
VICKSBURG, MISSISSIPPI 39180

IN REPLY REFER TO: WESEV

21 October 1980

Mr. Donald M. Liddell, Chief
Engineering Division
U. S. Army Engineer District, Buffalo
1776 Niagara St.
Buffalo, NY 14207

Dear Mr. Liddell:

Reference your letter of 29 September 1980 requesting Dredging Operations Technical Support (DOTS) assistance with wetlands habitat development as part of the Geneva-on-the-Lake Small-Boat Harbor Study. In response to your request, Mr. Charles Klimas of our staff traveled to Geneva and met with Mr. Bob Klips of the Buffalo District and Mr. Lyn MacLean of the U. S. Fish and Wildlife Service (FWS) on 6 and 7 October 1980 to review the habitat development plan.

In general, the habitat development plan (Alternative Plan 3b), as described in the final Fish and Wildlife Coordination Act Report, appears feasible. However, the following specific comments are provided for your consideration.

a. If the fill material is placed in ponds "A" and "B" as described, it is likely that the substrate will be conducive to the rapid establishment of marsh species. Though not mentioned in the FWS plan, the topsoil material should contain a great many marsh plant propagules in the form of tubers, root segments, stem segments, and seed, since it will be excavated primarily from an extremely productive marsh area. It is recommended that this material be regarded as a valuable resource, and that it not be stockpiled for any great length of time before it is placed in the ponds. If the viability of the propagules can be maintained, then the establishment of the new marshes should proceed rapidly, and erosion and changes in bottom configuration can be held to a minimum. The timing of the work will also have an impact on the rate of marsh development; if not precluded by other constraints, the substrate should be transferred late in the dormant season or very early in the growing season to achieve rapid cover.

b. Although the plan includes a provision for an outlet channel between pond "A" and the creek, it is suggested you consider an additional channel upstream to facilitate circulation around the newly created island. This would have the effect of preventing stagnation in the area behind the island and should increase the flushing of sediments and decaying plant material from the backwater area. Although no mention is made in the plan of the need for water circulation through pond "B", a similar system as that in pond "A"

EXHIBIT E-8

should be established if necessary. In addition, the control structure gate should be designed to permit rapid flushing to remove sediment, if possible.

c. The upland areas along and on top of the dikes within the wetland offer an opportunity for habitat development beyond that suggested in the plan. Although ryegrass and the dogwood species identified in the plan would be adequate, more diverse plantings would be desirable. Dogwoods already dominate the shrub communities in the area, and other species, such as species of Viburnum, would probably be preferable. If this approach interests you, it is suggested that you contact the nearest Soil Conservation Service (SCS) Plant Materials Center. The Waterways Experiment Station (WES) has had excellent cooperation in dealings with the SCS, and they have been willing to attempt to propagate native species which could not be obtained through commercial sources. Generally, however, at least a year of lead time is required to collect and propagate, so advance planning is vital.

d. The final comment is cautionary. The success of the plan rests entirely on the continuing close attention that must be paid to water level manipulations. Whatever agency is charged with management of the site, some firm guarantee must be obtained to insure that regular site visits are made. Since the historical water level variations are complex and not well documented, biologists competent to note and assess changes in the plant community must maintain familiarity with the site, and be prepared to alter the prescribed flooding regime. Failure to monitor and manage the site properly could result in severe degradation of the marsh (e.g. conversion to a monotypic stand of Phragmites or Typha). Worse, a complete lack of attention to the area could result in loss of much of the marsh vegetation in a very short time. It is suggested that firm, specific, long-term commitments be obtained in advance of any construction.

I hope you find these comments helpful. Please feel free to contact me if the WES can be of any further assistance.

Sincerely,

CHARLES C. CALHOUN, JR.
Program Manager
Dredging Operations Technical Support

TELEPHONE OR VERBAL CONVERSATION RECORD For use of this form, see AR 340-15; the proponent agency is The Adjutant General's Office.		DATE 12 January 1981
SUBJECT OF CONVERSATION Geneva-on-the-Lake Small-Boat Harbor Study - Proposed Harbor Development in Ashtabula, Ohio		
INCOMING CALL		
PERSON CALLING	ADDRESS	PHONE NUMBER AND EXTENSION
PERSON CALLED	OFFICE	PHONE NUMBER AND EXTENSION
OUTGOING CALL		
PERSON CALLING Richard Aguglia Ron Guido	OFFICE NCBED-PW NCBED-PC	PHONE NUMBER AND EXTENSION Ext. 2263 Ext. 2177
PERSON CALLED Hugh Thomas	ADDRESS Ashtabula County, Ohio Commissioners	PHONE NUMBER AND EXTENSION (216) 576-2040

SUMMARY OF CONVERSATION

1. On 12 January 1981, Ron Guido and I called Hugh Thomas of the Ashtabula County Commissioner's Office. The purpose of the call was to discuss their proposed small-boat harbor plans at Ashtabula, Ohio.

2. Mr. Thomas explained that originally they were considering two small-boat harbor facilities at Ashtabula: one at Walnut Beach, sponsored by the Ashtabula Port Authority; and one at Lakeshore Park, sponsored by the Ashtabula Parks Commission, the city and county of Ashtabula, the Ohio Department of Natural Resources, the Ohio Department of Energy and ODNR-Coastal Zone Management Section. Due to environmental and dredging problems, the Walnut Beach site was subsequently dropped from further consideration. Mr. Thomas also stated that the proposed harbor at Lakeshore Park would have about 400 berths.

3. Ron Guido explained that based on the regional boating demand analysis for Ashtabula County, which we recently completed for the Geneva-on-the-Lake Small-Boat Harbor Reformulation Phase I GDM study, there does not appear to be sufficient demand to justify small-boat harbor projects at Lakeshore Park and Geneva-on-the-Lake in the immediate future although the medium to long-term demand would warrant both projects. Mr. Thomas replied that based on their demand analysis, as contained in their Preliminary Engineering Report for the Lakeshore Park marina project (copy of which he is sending us), there is sufficient demand to justify both projects at the present time. In addition, Mr. Thomas' personal opinion is that there is sufficient demand to justify both projects now.

4. Dick Aguglia asked about the possible construction start of the Lakeshore Park marina project. Mr. Thomas replied that a construction date has not been established at this time due to lack of funding. The earliest this project could be built would be the mid 80's, however, the entire project is very tentative at this time.

5. Mr. Thomas will be visiting the Buffalo District office on 23 January 1981 to discuss this matter further.(See attachment 1)

RICHARD AGUGLIA
Project Manager

DA FORM 1 APR 66 751 REPLACES EDITION OF 1 FEB 58 WHICH WILL BE USED. ☆ U.S. GPO: 1974—580-839/8128

EXHIBIT E-9

DISPOSITION FORM

For use of this form, see AR 340-15, the proponent agency is TAGCEN.

REFERENCE OR OFFICE SYMBOL	SUBJECT
NCBED-PW	Summary Minutes of Meeting with Ashtabula County Commissioner's Staff - Geneva-on-the-Lake Small-Boat Harbor Study

XX THRU: Chief, Western Basin FROM Richard Aguglia DATE 3 February 1981 CMT 1
Chief, Economics Section

TO: Project Files

1. On 23 January 1981 representatives of the Ashtabula County Commissioner's Office met with Buffalo District staff to discuss differences between the results of their demand analysis for permanent small-boat berths in Ashtabula County along Lake Erie (1440 berths demanded in 1980), and the results of the demand analysis completed by the Corps during Stage 2 planning for the subject study (1110 berths demanded in 1980). The following people were in attendance:

Hugh Thomas	- Ashtabula County Commissioner's Office
Duane S. Feher	- " " " "
Albert J. Malinak	- Woodruff, Inc. - Cleveland
Ron Guido	- Corps of Engineers
Sharon Cooper	- Corps of Engineers
Roger Haberly	- Corps of Engineers
Dick Aguglia	- Corps of Engineers

2. Mr. Dick Aguglia opened the meeting at 1:00 p.m. and stated that the purpose of the meeting was to review the results of the demand analyses for permanent small-boat berths in Ashtabula County along Lake Erie independently completed by the Corps and the Commissioner's Office. Mr. Agulgia then stated that, based on a telephone conversation with Mr. Hugh Thomas on 12 January 1981, the Commissioner's Office believes there is sufficient unfulfilled demand for permanent berths to justify both the proposed small-boat harbor project at Geneva State Park and their proposed harbor for 400 boats at Ashtabula Harbor even though the results of the Corps analysis did not indicate this for the immediate future.

3. Mr. Thomas stated that the Ashtabula County Commissioner's Office supports both proposed projects and that there is sufficient unfulfilled demand to warrant both projects. Mr. Thomas also stated that he thinks demand for permanent berths in Ashtabula County will increase in the future for three reasons: 1) A larger percentage of boaters will be willing to travel to Ashtabula County as facilities in areas like Cleveland become harder and harder to obtain due to increased demand (Hugh also thinks the percentage of boaters willing to travel to Ashtabula County used in the Corps demand analysis is too low); 2) A large percentage of boaters who presently trailer their boats would rather use permanent berths if they were available; and 3) As the demand for launchings increases, due to greater fishing pressure, parking for trailers will become a problem, and boaters will want permanent berths in order to be guaranteed a parking spot and be able to get out into Lake Erie whenever they want. A resurgence of the fishery in Lake Erie is evident and subsequently fishing pressure has increased significantly during the past several years. Mr. Thomas also stated that the increased recreational opportunities afforded by both harbor projects would help in attracting industries to their area since their employees would enjoy a higher quality of life.

4. Mr. Malinak then discussed the difference in approaches for estimating demand for permanent berths in Ashtabula County along Lake Erie between the Corps and their analysis conducted for the Commissioner's Office. The main differences were as follows:

DA FORM 1 FEB 62 2496 REPLACES DD FORM 96, WHICH IS OBSOLETE.

Attachment # 1

a.) Woodruff, Inc. used a larger primary market area (Ashtabula, Lake, Trumbul, Geauga and a portion of Crawford Counties vs only Ashtabula County for the Corps Analysis, although the Corps did include these counties in their analysis as a secondary market area). The boundaries of their primary market were determined based on the home counties of boaters who presently use facilities in the City of Ashtabula.

b.) Woodruff, Inc. did not allocate demand for permanent berths in Ashtabula County to Pymatuning Reservoir since the reservoir has a 10-horsepower motor limitation and is unsuitable for sailing due to its shallow depth. (The Corps allocated approximately 40% of the berths demand by powerboats and 15% of the berths demanded by sailboats to Pymatuning Reservoir).

5. Ron Guido stated that the Corps will investigate the limitations of Pymatuning Reservoir and, if appropriate, modify Corps demand allocation between inland and Great Lakes dedication.

6. The meeting then adjourned at 2:00 p.m.

Richard Aguglia
RICHARD AGUGLIA
Project Manager

NCBED-PW 13 June 1979

James A. Swartzmiller, Chief Engineer
Ohio Department of Natural Resources
Fountain Square
Columbus, OH 43224

Dear Mr. Swartzmiller:

As per your request at the Geneva-on-the-Lake Small-Boat Harbor Study workshop meeting on 29 May 1979, the position paper presenting Buffalo District's interpretation of Executive Order 11990 as it relates to evaluation of practical alternatives is provided for your review (Inclosure 1). Plates of the four alternative harbor plans discussed in this paper were previously provided by letter dated 5 June 1979.

Please review the enclosed position paper and provide me with your comments by 2 July 1979 so that alternative selection may be incorporated into the Stage 2 report.

If you have any questions regarding this matter, please contact Mr. Richard Aguglia at (716) 876-5454, extension 2263.

Sincerely yours,

1 Incl
as stated

DONALD M. LIDDELL
Chief, Engineering Division

EXHIBIT E-10

Position Paper on Buffalo District Interpretation of Executive Order 11990 As It Relates to Evaluation of Practical Alternatives for the Geneva-on-the-Lake Small-Boat Harbor Study

1. The feasibility of constructing a small-boat harbor and harbor-of-refuge and recreational fishing facilities as an integral part of the State Park at Geneva-on-the-Lake, Ohio was studied by the Corps of Engineers in 1969. A harbor design was developed and the project was found to be economically justified at that time. The results of the feasibility were published in House Document No. 91-402 and a project was authorized for construction under Section 201 of the 1965 Flood Control Act (Public Law 89-298) by the House and Senate Committees on Public Works by Resolutions dated 15 December 1970 and 17 December 1970, respectively. Funds to initiate the Advanced Engineering and Design of the project were appropriated in Fiscal Year 1978.

2. Several legislative and physical changes, having a direct influence on the feasibility of constructing the authorized project, have occurred since the 1969 Interim Report was submitted to Congress and subsequently authorized for construction. The physical changes, depicted on Plate 1 (Attachment 1), include: the construction of a parking lot at the location originally proposed for the mooring area, and the expansion of an existing wetland area due to construction activities within the location originally proposed for the launching area and turning basin. Legislative actions, such as NEPA, that place increased emphasis on environmental preservation and enhancement, affect the decision on viability of water resources projects such as Geneva-on-the-Lake. Based on these factors, it was concluded that reformulation of the Geneva-on-the-Lake project was necessary. In addition, Executive Order 11990 (Attachment 2), issued 24 May 1977, places increased emphasis on preservation of wetlands. The requirements of Section 2 of the Executive Order provide the basis for our interpretation of the viability of alternative plans for the Geneva-on-the-Lake Small-Boat Harbor Study. A discussion of our interpretation as it relates to each of the four alternatives is presented in para. 4.

3. As part of this Reformulation Phase I GDM, Buffalo District personnel developed eight preliminary harbor layouts for the 18 January 1979 workshop meeting with the Ohio Department of Natural Resources (ODNR), the local sponsor for this project. As a result of this workshop meeting, four preliminary harbor layouts were eliminated from further consideration, and four alternative harbor layouts were identified for further in-depth study. The four alternative harbor layouts that were identified for further study were then developed

Incl 1

in sufficient detail to provide initial choices as to the range of viable resource management options available in the study area. Although the Corps did not develop the detailed engineering or advanced design criteria for each alternative, the alternatives were developed in sufficient detail to: (1) assure the basic engineering soundness of design; (2) identify all major components of each alternative; (3) estimate the first cost of construction and the annual operation and maintenance cost associated with each alternative; (4) estimate the benefits associated with each alternative; and (5) assess the impacts of each alternative on the existing environment based on the environmental data that was available. The results of the study were presented to the Ohio Department of Natural Resources and the U.S. Fish and Wildlife Service at the 29 May 1979 workshop meeting.

4. In view of Executive Order 11990, which prohibits Federal participation in construction in wetland areas when a practical alternative to such construction exists, Buffalo District made a preliminary interpretation as to whether or not the four alternative harbor layouts were "practical." In making this interpretation, Buffalo District considered, among other things, the stated views of ODNR and the U.S. Fish and Wildlife Service, the costs and benefits associated with each alternative, the impact of each alternative on the existing and future park facilities, the impact of each alternative on the environment, and the safety and well-being of the general public. It is noted, however, that due to the lack of current biological information for the area, a suitable mitigation plan could not be formulated for the alternatives studied and therefore its cost has not been included in the benefit-cost ratios that were developed. The preliminary interpretation of the Buffalo District is as follows:

a. Alternative #1 (Cowles Creek Alternative) - Even though the benefit-cost ratio for this alternative is greater than 1 (see Attachment 3), Alternative #1 was not considered a practical alternative for the following reasons:

(1) This alternative would destroy approximately one-half of the parking lot, cause relocation of the pedestrian foot bridge crossing Cowles Creek, and would reduce direct access to the bathhouse serving Beach A. It is also believed that ODNR would not support this alternative due to this disruption of existing park facilities.

(2) The entrance channel for this alternative would be between Beach A and Beach B and thus, boating activity would be placed in close proximity to swimming activities. This would create an unsafe condition. Although buoys would outline the limit of the swimming and boating areas, the probability of a potentially fatal accident is greater with this alternative than with the other alternatives investigated.

(3) Due to the narrowness and orientation of the offshore trough which was utilized as the entrance channel for this alternative, the entrance conditions for boaters entering the harbor during storms are not as safe as the other alternatives studied. Storms originating from the northwest would cause waves to strike the entering boat broadside. Boaters would also be required to turn immediately after entering the entrance channel which will present difficulties to sailboaters. Relocating the entrance channel would require extensive rock excavation and an increase in breakwater length which would greatly increase the cost of this alternative.

b. Alternative #2 (offshore-onshore alternative) - Alternative #2 is considered a practical alternative for the following reasons:

(1) The benefit-cost ratio is greater than 1 (see Attachment 3).

(2) The alternative would not disrupt the existing and future park facilities.

(3) The alternative would directly impact only a limited area in the northeast corner of the wetland area which could be compensated for with suitable mitigation. It is noted, however, that this alternative would indirectly impact on the mouth of the drainage outlet for the wetland area. Due to the lack of biological information in the area, it is not known at this time whether or not this indirect impact is significant. When the information required to make this determination is available (October 1979), Buffalo District will reexamine its position on this alternative.

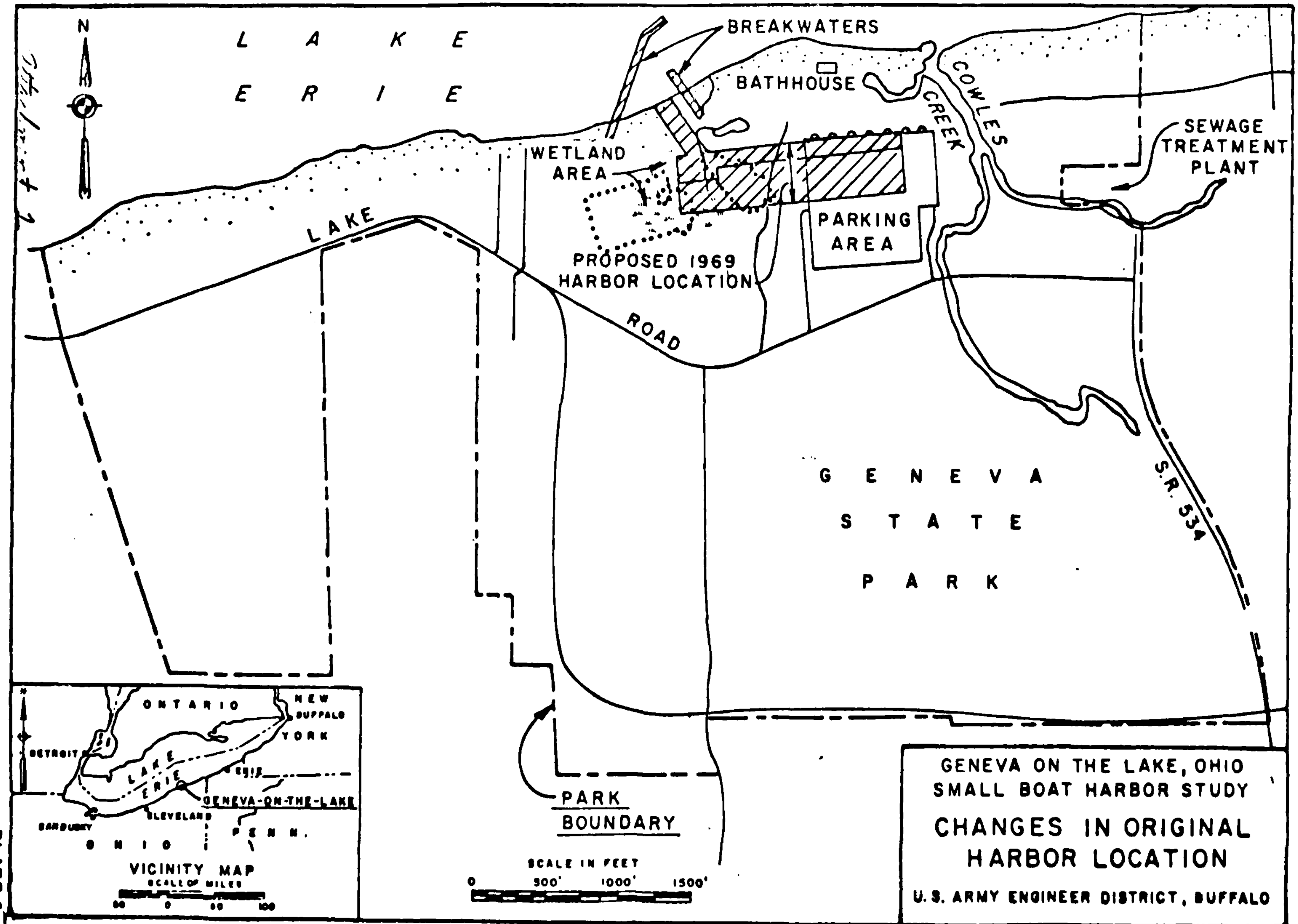
c. Alternative #3 (wetland-parking lot alternative) - Alternative #3 is considered a practical alternative for the following reasons:

(1) The benefit-cost ratio is greater than 1.0 (see Attachment 3).

(2) Although this alternative would destroy a portion of the parking lot and would reduce access to the bathhouse, its impact would not be as severe as Alternative No. 1. It would not, however, interfere with the access between Beach A and Beach B.

(3) The impact of this alternative on the wetland area is basically the same as Alternative No. 2.

d. Alternative #4 (wetland alternative) - Since practical alternatives exist for construction of a small-boat harbor outside the wetland area, it is the opinion of the Buffalo District that construction of Alternative #4 would be in violation of Executive Order 11990. Therefore, it is Buffalo District's position that this alternative be eliminated from further consideration.



GENEVA ON THE LAKE, OHIO
SMALL BOAT HARBOR STUDY

CHANGES IN ORIGINAL HARBOR LOCATION

U.S. ARMY ENGINEER DISTRICT, BUFFALO

Exhibit 1

PLATE 4

EXECUTIVE ORDER

No. 11990

May 24, 1977, 42 F.R. 26961

PROTECTION OF WETLANDS

By virtue of the authority vested in me by the Constitution and statutes of the United States of America, and as President of the United States of America, in furtherance of the National Environmental Policy Act of 1969, as amended (42 U.S.C. 4321 et seq.), in order to avoid to the extent possible the long and short term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative, it is hereby ordered as follows:

Section 1. (a) Each agency shall provide leadership and shall take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands in carrying out the agency's responsibilities for (1) acquiring, managing, and disposing of Federal lands and facilities, and (2) providing Federally undertaken, financed, or assisted construction and improvements; and (3) conducting Federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulating, and licensing activities.

(b) This Order does not apply to the issuance by Federal agencies of permits, licenses, or allocations to private parties for activities involving wetlands on non-Federal property.

Sec. 2. (a) In furtherance of Section 101(b)(3) of the National Environmental Policy Act of 1969 (42 U.S.C. 4331(b)(3)) to improve and coordinate Federal plans, functions, programs and resources to the end that the Nation may attain the widest range of beneficial uses of the environment without degradation and risk to health or safety, each agency, to the extent permitted by law, shall avoid undertaking or providing assistance for new construction located in wetlands unless the head of the agency finds (1) that there is no practicable alternative to such construction, and (2) that the proposed action includes all practicable measures to minimize harm to wetlands which may result from such use. In making this finding the head of the agency may take into account economic, environmental and other pertinent factors.

(b) Each agency shall also provide opportunity for early public review of any plans or proposals for new construction in wetlands, in accordance with Section 2(b) of Executive Order No 11514,[31] as amended, including the development of procedures to accomplish this objective for Federal actions whose impact is not significant enough to require the preparation of an environmental impact statement under Section 102(2)(C) of the National Environmental Policy Act of 1969, as amended.

31. 42 U.S.C.A. § 4321 note.

attachment 2

Sec. 3. Any requests for new authorizations or appropriations transmitted to the Office of Management and Budget shall indicate, if an action to be proposed will be located in wetlands, whether the proposed action is in accord with this Order.

Sec. 4. When Federally-owned wetlands or portions of wetlands are proposed for lease, easement, right-of-way or disposal to non-Federal public or private parties, the Federal agency shall (a) reference in the conveyance those uses that are restricted under identified Federal, State or local wetlands regulations; and (b) attach other appropriate restrictions to the uses of properties by the grantee or purchaser and any successor, except where prohibited by law; or (c) withhold such properties from disposal.

Sec. 5. In carrying out the activities described in Section 1 of this Order, each agency shall consider factors relevant to a proposal's effect on the survival and quality of the wetlands. Among these factors are:

(a) public health, safety, and welfare, including water supply, quality, recharge and discharge; pollution; flood and storm hazards; and sediment and erosion;

(b) maintenance of natural systems, including conservation and long term productivity of existing flora and fauna, species and habitat diversity and stability, hydrologic utility, fish, wildlife, timber, and food and fiber resources; and

(c) other uses of wetlands in the public interest, including recreational, scientific, and cultural uses.

Sec. 6. As allowed by law, agencies shall issue or amend their existing procedures in order to comply with this Order. To the extent possible, existing processes, such as those of the Council on Environmental Quality and the Water Resources Council, shall be utilized to fulfill the requirements of this Order.

Sec. 7. As used in this Order:

(a) The term "agency" shall have the same meaning as the term "Executive agency" in Section 105 of Title 5 of the United States Code and shall include the military departments; the directives contained in this Order, however, are meant to apply only to those agencies which perform the activities described in Section 1 which are located in or affecting wetlands.

(b) The term "new construction" shall include draining, dredging, channelizing, filling, diking, impounding, and related activities and any structures or facilities begun or authorized after the effective date of this Order.

(c) The term "wetlands" means those areas that are inundated by surface or ground water with a frequency sufficient to support and under normal circumstances does or would support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include swamps, marshes, bogs, and similar areas such as sloughs, potholes, wet meadows, river overflows, mud flats, and natural ponds.

Sec. 8. This Order does not apply to projects presently under construction, or to projects for which all of the funds have been appropriated through Fiscal Year 1977, or to projects and programs for which a draft or final environmental impact statement will be filed prior to October 1, 1977. The provisions of Section 2 of this Order shall be implemented by each agency not later than October 1, 1977.

Sec. 9. Nothing in this Order shall apply to assistance provided for emergency work, essential to save lives and protect property and public health and safety, performed pursuant to Sections 305 and 306 of the Disaster Relief Act of 1974 (88 Stat. 148, 42 U.S.C. 5145 and 5146).

Sec. 10. To the extent the provisions of Sections 2 and 5 of this Order are applicable to projects covered by Section 104(h) of the Housing and Community Development Act of 1974, as amended (88 Stat. 640, 42 U.S.C. 5304(h)), the responsibilities under those provisions may be assumed by the appropriate applicant, if the applicant has also assumed, with respect to such projects, all of the responsibilities for environmental review, decisionmaking, and action pursuant to the National Environmental Policy Act of 1969, as amended.

JIMMY CARTER

THE WHITE HOUSE,
May 24, 1977.

Attachment 3

Summary of Project Costs and Benefits 1/
Alternative No. 1

Item	Federal	Non-Federal 2/	Total 2/
	$	$	$
First Cost	1,999,000	2,096,000	4,095,000
Interest During Construction	137,400	144,100	281,500
Total Investment Cost	2,136,400	2,240,100	4,376,500
Lands and Damages	0	557,000	557,000
Total Project Costs	2,136,400	2,797,100	4,933,500
Annual Charges			
Interest	146,900	192,300	339,200
Amortization	5,500	7,200	12,700
Maintenance	39,400	3,300	42,700
Total	191,800	202,800	394,600
Annual Benefits 3/			459,500
Benefit-Cost Ratio			1.16

1/ Based on May 1979 price levels, 6-7/8 percent interest rate, and a 50-year economic life.
2/ Does not include self-liquidating cost for mooring area, launching ramps, and public service facilities currently estimated at $4,150,000 (May 1979 prive levels).
3/ Does not include benefits for recreational breakwater fishing.

Summary of Project Costs and Benefits 1/
Alternative No. 2

Item	Federal	Non-Federal 2/	Total 2/
	$	$	$
First Cost	2,098,000	2,050,000	4,148,000
Interest During Construction	144,200	140,900	285,100
Total Investment Cost	2,242,200	2,190,900	4,433,100
Lands and Damages	0	50,000	50,000
Total Project Costs	2,242,200	2,240,900	4,483,100
Annual Charges			
Interest	154,100	154,100	308,200
Amortization	5,800	5,800	11,600
Maintenance	36,200	8,200	44,400
Total	196,100	168,100	364,200
Annual Benefits 3/			459,500
Benefit-Cost Ratio			1.26

1/ Based on May 1979 price levels, 6-7/8 percent interest rate, and a 50-year economic life.
2/ Does not include self-liquidating cost for mooring area, launching ramps, and public service facilities currently estimated at $3,580,000 (May 1979 prive levels).
3/ Does not include benefits for recreational breakwater fishing.

Summary of Project Costs and Benefits 1/
Alternative No. 3

Item	Federal	Non-Federal 2/	Total 2/
	$	$	$
First Cost	1,599,000	1,575,000	3,174,000
Interest During Construction	109,900	108,300	218,200
Total Investment Cost	1,708,900	1,683,300	3,392,200
Lands and Damages	0	404,000	404,000
Total Project Costs	1,708,900	2,087,300	3,796,200
Annual Charges			
Interest	117,500	143,500	261,000
Amortization	4,400	5,400	9,800
Maintenance	29,200	4,500	33,700
Total	151,100	153,400	304,500
Annual Benefits 3/			459,500
Benefit-Cost Ratio			1.51

1/ Based on May 1979 price levels, 6-7/8 percent interest rate, and a 50-year economic life.
2/ Does not include self-liquidating cost for mooring area, launching ramps, and public service facilities currently estimated at $4,13[illegible] (May 1979 prive levels).
3/ Does not include benefits for recreational breakwater fishing.

Summary of Project Costs and Benefits 1/
Alternative No. 4

Item	Federal	Non-Federal 2/	Total 2/
	$	$	$
First Cost	1,424,000	1,400,000	2,824,000
Interest During Construction	97,900	96,300	194,200
Total Investment Cost	1,521,900	1,496,300	3,018,200
Lands and Damages	0	78,000	78,000
Total Project Costs	1,521,900	1,574,300	3,096,200
Annual Charges			
Interest	104,600	108,200	212,800
Amortization	3,900	4,000	7,900
Maintenance	28,000	3,900	31,900
Total	136,500	116,100	252,600
Annual Benefits 3/			459,500
Benefit-Cost Ratio			1.82

1/ Based on May 1979 price levels, 6-7/8 percent interest rate, and a 50-year economic life.
2/ Does not include self-liquidating cost for mooring area, launching ramps, and public service facilities currently estimated at $3,[illegible] (May 1979 prive levels).
3/ Does not include benefits for recreational [illegible]

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Division of Ecological Services
Columbus Field Office
3990 East Broad Street
Columbus, Ohio 43215

IN REPLY REFER TO:

July 2, 1979

Mr. Ronald M. Liddell
Chief, Engineering Division
U.S. Army Engineer District
Buffalo
1776 Niagara Street
Buffalo, New York 14207

Dear Mr. Liddell:

The U.S. Fish and Wildlife Service has reviewed your letter of June 13, 1979, presenting the Buffalo District's interpretation of Executive Order 11990 as it relates to evaluation of the four alternative harbor plans for Geneva-State Park.

We agree with your position that construction of Alternative #4 would be in violation of Executive Order 11990 as practical alternatives do exist. However, we would request that Alternative # 1 continue to be considered as a practical alternative for the following reasons:

1. Alternative # 1 does have a favorable B/C ratio.

2. While Alternative # 1 would seperate the bathhouse from the beach east of Cowles Creek, it would be the only alternative that would create and maintain a natural beach directly lakeward of the bathhouse. All other alternatives would result in erosion directly lakeword of the bathhouse, requiring a sand by-pass system and additional shoreline protection similar to that that would be required east of Cowles Creek for Alternative # 1. A large beach formed or maintained by a breakwater at Cowles Creek would reduce the necessity of having a second beach east of Cowles Creek. Bathers still desiring to use the east beach could use the bathhouse facilities presently available on the east side of Cowles Creek. The land isolated between the harbor channel and Cowles Creek could be utilized as a beach by the boaters. If the foot bridge were not removed, the boaters would have ready access to the picnic area east of Cowles Creek.

3. There does not appear to have been coordination between the shoreline erosion control needs at Geneva State Park, the design of the harbor, and the reestablishment of a bathing beach. The total costs and benefits of harbor construction, associated erosion control, beach protection and maintenance, and mitigation of environmental impacts should be considered together. When they are, Alternative # 1 may have the lowest total cost of the harbor designs being considered.

EXHIBIT E-11

4. Alternative # 1 would be the only alternative that would not interrupt direct access along the beach from the bathhouse and associated parking lot to the nature center to be built west of the wetland area.

5. While Alternative # 1 does juxtapose a harbor entrance and swimming beaches, we do not believe that it poses a significantly higher risk of boat-swimmer collisions than that posed by the other alternative harbor layouts. All alternatives would have the harbor entrance within approximately one quarter mile or less of the swimming beaches.

6. While the entrance channel for Alternative # 1 does involve a slight turn, we believe that the design criterium width of 100 feet provides adequate clearance for a safe entrance to the harbor even during storms.

7. We believe that the amount of parking lot lost due to construction of Alternative # 1 might be reduced if the harbor basin can be located slightly closer to the lake. There is also additional parking available south of the bathhouse parking lot on the south side of Lake Road. Finally, additional parking lanes could be constructed on the west side of the parking lot in the vicinity of the marina under alternative # 2, or immediately south of the main parking lot.

8. Alternative # 1 appears at this time to involve the least direct and indirect impacts upon the wetland areas and would probably involve the lowest cost for mitigation of environmental impacts.

9. The potential for fishery resource enhancement appears to be higher for Alternative # 1 than for the other alternatives. A significant number of salmonids stocked in Arcola Creek appear to stray to Cowles Creek during their homing migration. The breakwaters associated with Alternative # 1 may provide increased access to this salmonid fishery in addition to providing spawning, nursery, and feeding areas for some of the fish species indigenous to Cowles Creek.

Regarding the other alternatives, Alternative # 2 has a favorable B/C ratio and avoids the major portions of the wetland. A water control structure for the wetland may be required. Alternative # 3 has a favorable B/C ratio but impacts the northeast portion of the wetlands. As practical alternatives involving lesser damages to the wetlands exist, we believe that Alternative # 3 should be dropped from further consideration by the Corps.

While these opinions are subject to change based upon data generated during the completion of our four season study, the U.S. Fish and Wildlife Service would recommend at this time that Alternatives # 1 and # 2 continue to be given serious consideration as practical designs subject to future refinement.

Sincerely yours,

Conrad A. Fjetland

Conrad A. Fjetland
Supervisor

cc: Regional Administrator, U.S. EPA, Federal Activities Br., Chicago, IL
Chief, ODNR, Div. of Wildl., Columbus, OH

United States Department of the Interior

IN REPLY REFER TO:

FISH AND WILDLIFE SERVICE
Division of Ecological Services
Columbus Field Office
3990 East Broad Street
Columbus, Ohio 43215

July 6, 1979

Mr. Ronald M. Liddell
Chief, Engineering Division
U.S. Army Engineer District
Buffalo
1776 Niagara Street
Buffalo, New York 14207

Dear Mr. Liddell:

The following letter provides a modification of the U.S. Fish and Wildlife Service letter of July 2, 1979, to you regarding the harbor alternatives for Geneva State Park.

In addressing Alternative # 1 we had mistakenly interpreted the east limit of the interior federal channel to be the east limit of the harbor. The actual harbor limits were obscured by the various contour lines shown on our monochrome drawings. In light of this discovery, the following sections of our letter of July 2, 1979,should be deleted:

statement # 2 - last two sentences

statement # 7 - first sentence

It appears that the only way to reduce the area of parking lot lost if Alternative # 1 were to be selected would be to modify the Alternative by replacing some of the inshore mooring area with an expanded offshore mooring area.

Sincerely yours,

Conrad A. Fjetland

Conrad A. Fjetland
Supervisor

cc: Regional Administrator, U.S. EPA, Federal Activities Br., Chicago, IL
ODNR, Outdoor Recreation Serv., Attn: Mike Colvin, Columbus, OH

EXHIBIT E-1

ODNR
Ohio Department of Natural Resources
OFFICE OF CHIEF ENGINEER
Fountain Square · Columbus, Ohio 43224 · (614) 466-4633

July 17, 1979

Donald M. Liddell, Chief
Engineering Division
Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Dear Mr. Liddell:

Reference is made to your letters of July 5th and July 13, 1979 regarding the Geneva Small Boat Harbor Project.

We have reviewed the alternatives submitted and have developed several others for your consideration. These two alternatives that we have developed are alterations of alternate #3. The sketches are to be considered preliminary only as further modifications and adjustments may be necessary before finalization. We submit them for your review and consideration.

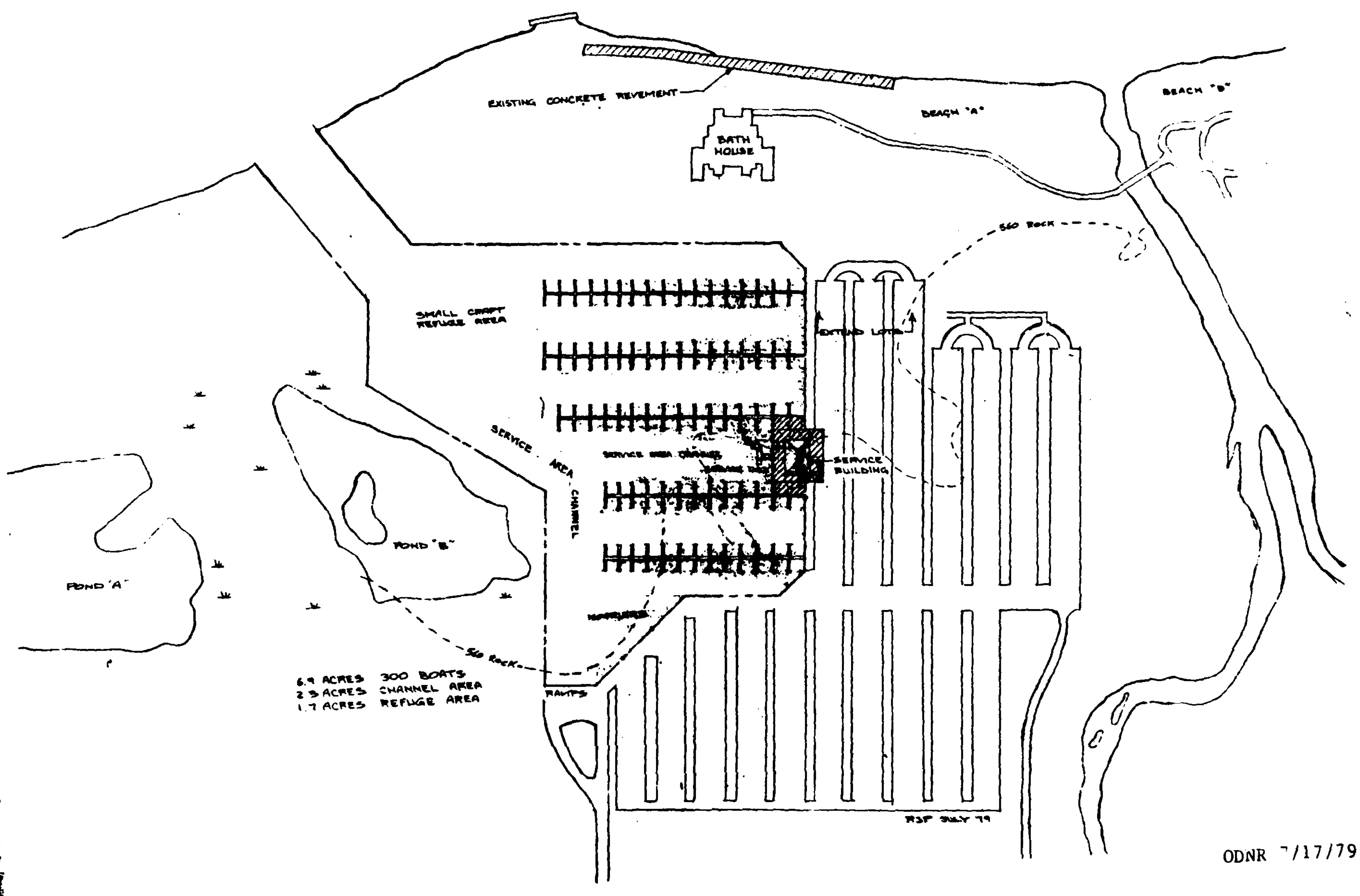
Regarding your position paper on practical alternatives we are somewhat appalled that costs are not considered in arriving at practicality of solutions. Surely the existing marsh must have a monetary value and this should be considered in any cost ratio along with any mitigation measures that may be necessary.

Sincerely,

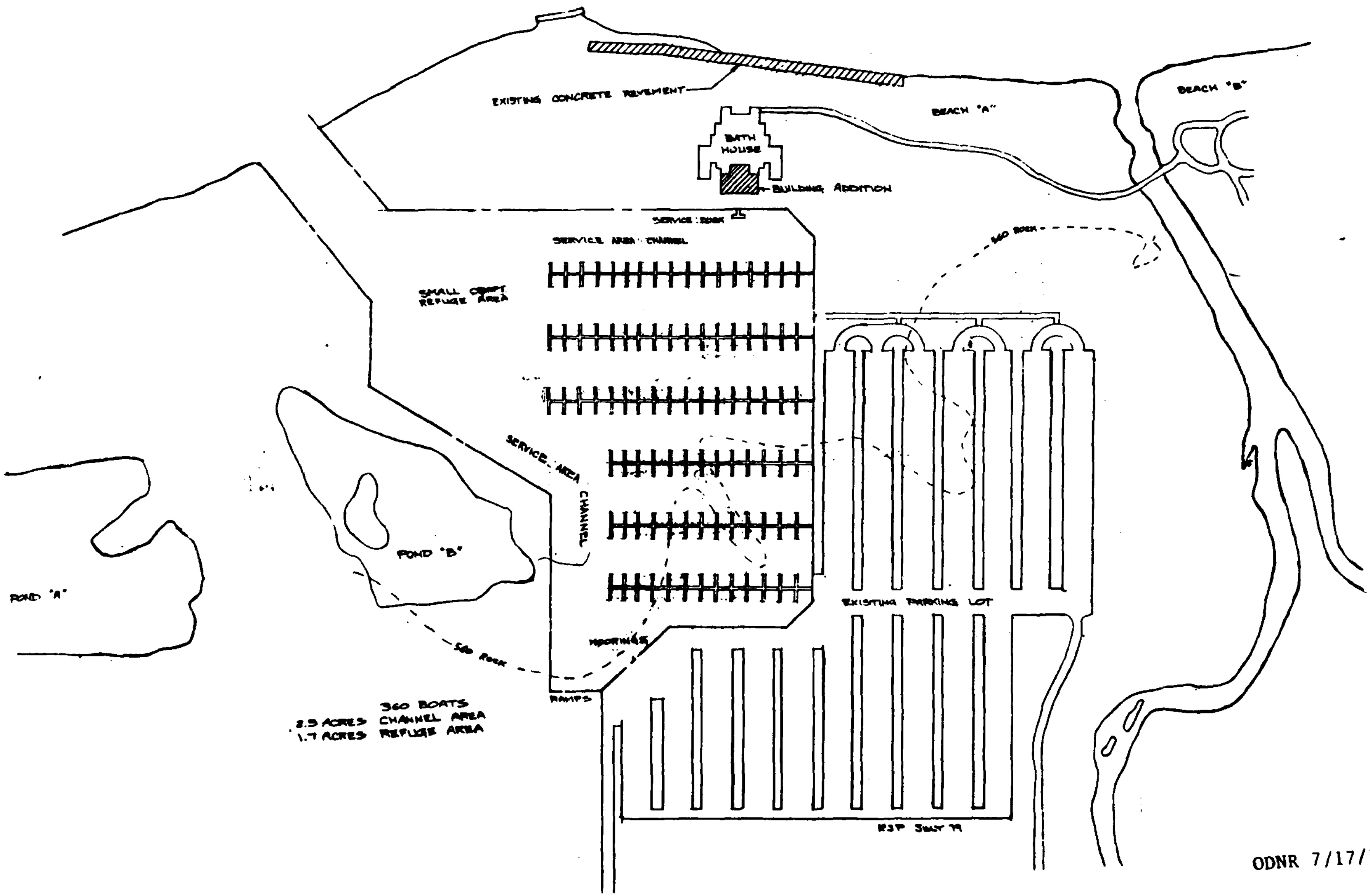
JAMES A. SWARTZMILLER
CHIEF ENGINEER

JAS:bm
cc: Don Olson
Norv Hall

EXHIBIT E-13


EXISTING CONCRETE REVEMENT
BATH HOUSE
BEACH "A"
BEACH "B"
560 ROCK
SMALL CRAFT REFUGE AREA
EXTEND LOTS
SERVICE BUILDING
SERVICE AREA CHANNEL
POND "B"
POND 'A'
RAMPS
6.9 ACRES 300 BOATS
2.3 ACRES CHANNEL AREA
1.7 ACRES REFUGE AREA
RSF JULY 79

ODNR 7/17/79


EXISTING CONCRETE REVEMENT
BEACH "A"
BEACH "B"
BATH HOUSE
BUILDING ADDITION
SERVICE DOCK
SERVICE AREA CHANNEL
SMALL CRAFT REFUGE AREA
SERVICE AREA CHANNEL
POND "B"
POND "A"
MOORINGS
RAMPS
EXISTING PARKING LOT
360 BOATS
2.5 ACRES CHANNEL AREA
1.7 ACRES REFUGE AREA

ODNR 7/17/79

ODNR

Ohio Department of Natural Resources

Fountain Square · Columbus Ohio 43224 · (614) 466-3770

May 29, 1980

Colonel George P. Johnson, District Engineer
U.S. Army Engineer District, Buffalo
1776 Niagara Street
Buffalo, New York 14207

Dear Colonel Johnson:

Members of my staff and myself met with representatives from the Columbus office of the U.S. Fish and Wildlife Service on the proposed small boat harbor project for Geneva State Park. The purpose of our meeting was to hopefully reach an agreement on selecting an alternative(s) site which we could recommend to the Corps for detailed design.

Based on a careful analysis of the alternative sites, considering such factors as prudent investment of public funds, protection of wetlands and overall design, we have agreed on alternative #3 (as modified in the appendix of the Stage 2 Project Report) as being the best alternative for project implementation. Recommended mitigation features include screened plantings along the southwest portion of the harbor to buffer marina activities from the wetland area and partial filling of Pond A to provide for enhancement of the wetland.

Two additional items discussed at the meeting include placement of spoil material in Pond B southwest of and adjacent to the proposed mooring area to provide for additional enhancement, and the possibility of using the same breakwall configuration as proposed in alternative #2 as a means of increasing fishing opportunities. Although we have not reached an agreement on these last two items, we request that you consider these during your detailed design phase.

As discussed between your Don Liddell and Bob Lucas of my staff, I feel all parties, the Corps, U.S. Fish and Wildlife Service and ODNR, should get together at an early date to reach a final agreement on a selected plan.

The Geneva Small Boat Harbor project continues to be one of our top priority projects in the Department of Natural Resources, and it is my hope we can move toward a very early construction.

Sincerely,

Robert W. Teater

ROBERT W. TEATER
Director

RWT/dsc
cc: Mr. Kent Kroonemeyer
U.S. Fish and Wildlife Service

EXHIBIT E-14

ODNR
Ohio Department of Natural Resources
Fountain Square · Columbus, Ohio 43224 · (614) 466-3770

April 15, 1981

Colonel George P. Johnson
District Engineer
U.S. Army Engineer Dist. Buffalo
1776 Niagara Street
Buffalo, New York 14207

Dear Colonel Johnson:

This will acknowledge receipt of your letter of 7 April 1981 concerning the proposed Geneva-on-the-Lake Small Boat Harbor project.

We appreciate your recognition of this project as a high priority and your commitment to meeting the set schedule for post authorization planning. Please be assured of our interest in satisfying all necessary requirements relative to project mitigation features. In addition, the provisions of Section 221 do not appear to present significant problems with regard to the Geneva project.

Therefore, we wish to reemphasize our own interest and support in moving the proposed project towards early construction.

Sincerely,

Robert W. Teater

ROBERT W. TEATER
Director

RWT:jp

EXHIBIT E-15

ODNR
Ohio Department of Natural Resources
OFFICE OF CHIEF ENGINEER
Fountain Square · Columbus, Ohio 43224 · (614) 466-4633

October 22, 1980

U.S. Army Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Attention: Richard Aguglia

Dear Mr. Aguglia:

As requested at our meeting on the Geneva Refuge Harbor, attached is our preliminary plan for the proposed roadways and parking for the refuge harbor now under study by your office.

Regarding the facilities to be provided by the department at the proposed marina, these will consist of floating docks which may include water and electric service to each individual dock. Area lighting will be provided for safety purposes and a small concession for the sale of marine fuel and supplies will be included. Plans for the marina will be developed as the refuge harbor is being designed.

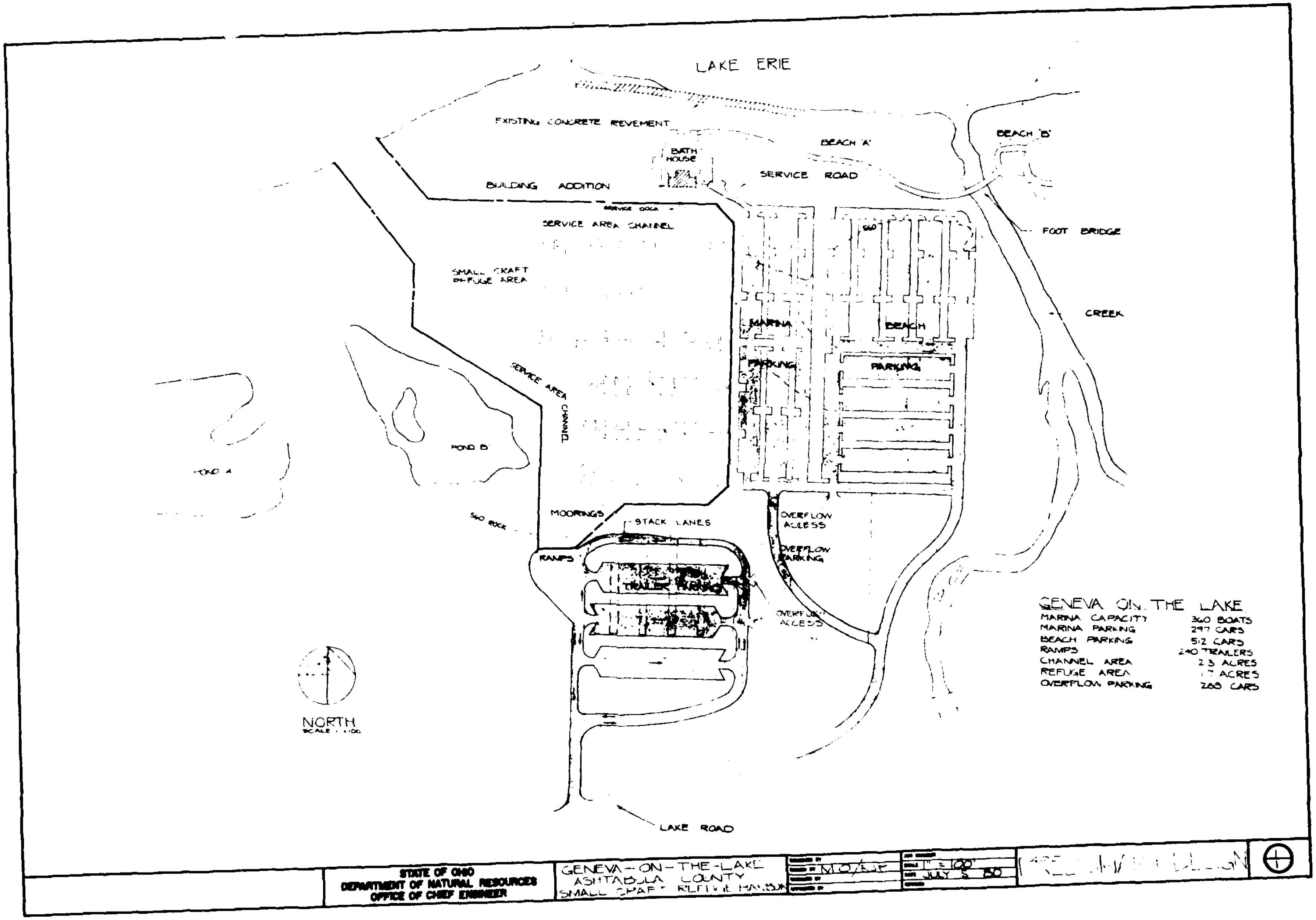
Should you have any questions regarding the plan or the above please contact us.

Sincerely,

JAMES A. SWARTZMILLER
CHIEF ENGINEER

JAS:bm
Encls.
cc: Don Olson
Roger Hubbell

EXHIBIT E-16


LAKE ERIE
EXISTING CONCRETE REVEMENT
BATH HOUSE
BEACH 'A'
BEACH 'B'
SERVICE ROAD
BUILDING ADDITION
SERVICE DOCK
SERVICE AREA CHANNEL
FOOT BRIDGE
SMALL CRAFT REFUGE AREA
CREEK
MARINA PARKING
BEACH PARKING
SERVICE AREA CHANNEL
POND B
POND A
MOORINGS
STACK LANES
RAMPS
OVERFLOW ACCESS
OVERFLOW PARKING
TRAILER PARKING
BOAT
NORTH
LAKE ROAD
GENEVA ON THE LAKE
MARINA CAPACITY 360 BOATS
MARINA PARKING 297 CARS
BEACH PARKING 512 CARS
RAMPS 240 TRAILERS
CHANNEL AREA 23 ACRES
REFUGE AREA 17 ACRES
OVERFLOW PARKING 268 CARS
STATE OF OHIO
DEPARTMENT OF NATURAL RESOURCES
OFFICE OF CHIEF ENGINEER
GENEVA-ON-THE-LAKE
ASHTABULA COUNTY
JULY 5 '80

COMMENT/RESPONSE ON THE DRAFT REFORMULATION
PHASE I GENERAL DESIGN MEMORANDUM AND
DRAFT ENVRONMENTAL IMPACT STATEMENT

Date	Comment Letter From	Exhibit
	FEDERAL	
15 July 1981	U.S. Environmental Protection Agency	E-17
21 July 1981	U.S. Department of Commerce	E-18
24 July 1981	U.S. Department of the Interior	E-19
	STATE	
29 June 1981	State Clearinghouse	E-20
21 July 1981	Ohio Department of Natural Resources	E-21
	GROUPS/ORGANIZATIONS/LOCAL AGENCIES	
	No comment letters received	
	INDIVIDUALS	
	No comment letters received	

UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY
REGION V
230 SOUTH DEARBORN ST
CHICAGO, ILLINOIS 60604

REPLY TO ATTENTION OF:

15 JUL 1981

Colonel George P. Johnson
District Engineer
U.S. Army Engineer District, Buffalo
1776 Niagara Street
Buffalo, New York 14207

RE: NEPA DE-COE-F39015-OH
(81062)

Dear Colonel Johnson:

1 We have completed our review of the Draft Environmental Impact Statement (EIS) and Draft Reformulation Phase I General Design Memorandum for the small-boat harbor project at Geneva-on-the-Lake, Ashtabula County, Ohio dated April 1981. The tentatively selected plan (3b) would provide an all weather, onshore harbor with a single berthing area for 360 boats on lands which are presently a wetland area, in part, and partly lawn and parking areas.

2 We have classified the Draft EIS as Category ER-1. Specifically, this means that we have reservations regarding the environmental effects of this action. The Draft EIS adequately sets forth the environmental impacts of the proposed action, as well as alternatives reasonably available to the project. Our reservations stem from the potential wetland loss with implementation of Plan 3b, particularly in light of an alternative (Plan 1) that would avoid this loss. A 5 March 1981 site visit by members of my staff particularly impressed them of the value of the wetland to be disrupted by the proposed action. The classification and date of our comments will be published in the Federal Register in accordance with our responsibility to inform the public of our views on proposed Federal actions under Section 309 of the Clean Air Act.

We appreciate the opportunity to review this Draft EIS. If you have any questions regarding our comments, please contact Rick Pitorak of my staff at FTS 886-6689.

Sincerely yours,

Barbara Taylor Backley

Barbara Taylor Backley, Chief
Environmental Impact Review Staff
Office of Environmental Review

Attachment

EXHIBIT E-1

U.S. ENVIRONMENTAL PROTECTION AGENCY (15 July 1981)

1. Thank you for your review. Your individual comments are discussed below and on the following pages.

2. Your opinions are acknowledged regarding the environmental effects of this action. Note, however, that the alternative (Plan 1) which would avoid the particular wetland losses associated with the selected plan would have caused the loss, albeit somewhat smaller, of a portion of the Cowles Creek ecosystem, including a portion of wetland. More significantly, Plan 1 is not a practicable alternative.

Comments by the U.S. Environmental Protection Agency on the Draft
Environmental Impact Statement for the Small-Boat Harbor at
Geneva-on-the-Lake, Ashtabula County, Ohio

3 The Draft Environmental Impact Statement (EIS) for the small-boat harbor at Geneva-on-the-Lake addresses two alternatives which differ significantly in degree of impact to the environment. The two alternatives are Alternative Plan 3b, the modified wetland/parking lot alternative and Alternative Plan 1, the Cowles Creek Harbor alternative. Plan 3b is the tentatively selected plan for implementation, and Plan 1 was eliminated from consideration during Stage 2 of the planning effort for this project due to a lack of sponsor support.

Plan 3b provides for a 360 - slip all weather harbor located on land which is partly a wetland area, and partly parking and lawn areas. The small - boat harbor mooring area and harbor-of-refuge would occupy approximately 15.6 acres inland near the shore. It would be connected with Lake Erie via an entrance channel 100-feet wide and 400-feet long which would be protected by a pair of rubblemound breakwaters extending into the lake.

4 Plan 3b would initially cause a considerable amount of irreversible wetland destruction. The harbor is planned to be situated on an area which includes 2.3 acres of wet meadow, shallow marsh, and deep marsh combined. There is a total of 6.6 acres of wet meadow and marsh in the immediate vicinity of the proposed project; this herbaceous wetland is part of a marsh/swamp complex of approximately 9.6 acres. The completed harbor would be located contiguous to the remaining wetland area.

Plan 1, the Cowles Creek Harbor Alternative, would locate a 400-slip boat harbor and harbor-of-refuge at the mouth of Cowles Creek. The harbor entrance would be located immediately offshore from Cowles Creek. The entrance would be protected by a modified arrowhead rubblemound breakwater system. A 2.5 acre site at the mouth of Cowles Creek with a capacity for 100 slips and a 7.4 acre site in the existing parking lot with a 300 slip capacity would comprise the mooring basins under this alternative. The interior channel to the mooring basin would be 100-feet wide to the west and 130-feet wide to the east.

5 Although Plan 1 did not progress beyond Stage 2 of the planning process, due to lack of sponsor support, it appears to be the alternative most compatible with the existing environmental setting. Undoubtedly, more detailed information regarding the aquatic ecosystem of Cowles Creek would be necessary to completely ascertain the environmental advantages of Plan 1 over Plan 3b.

6 Additionally, we recognize the knowledgeable efforts that have gone into devising project features that should accomplish mitigation of project - induced damage to the natural environment if Plan 3b is implemented. A water control structure, an impermeable levee, partial filling of borrow pits, and selective plantings of adapted species can all contribute to adequate compensation for project induced damages to the marsh/swamp complex of wetlands in the area. However, the existence of an alternative (Plan 1) which could avoid adverse impacts and is more compatible with the existing environmental setting than the tentatively selected plan (Plan 3b), leads to our reservations regarding the environmental impacts of the proposed project.

<u>U.S. ENVIRONMENTAL PROTECTION AGENCY (Cont'd)</u>

3. Note that while lack of sponsor support was a conclusive factor leading to the elimination of Plan 1 from consideration for detailed study, the deficiency of the plan which caused it to be regarded with disfavor by the local sponsor also reduced its viability as a candidate for selection, without relation to the sponsor support factor. This deficiency is severe disruption of park facilities in the form of isolation of the bathhouse and severance of the two beach areas.

4. This is in agreement with information presented in the DEIS.

5. An environmental comparison of Plan 3b with Plan 1 was presented on page 105 of the GDM and is repeated here. Plan 1, originally suggested by the U.S. Fish and Wildlife Service, addressed the environmental concerns at Geneva State Park without consideration of adverse impacts to existing park facilities and was formulated to minimize impact to the wetland area. However, with due consideration to other planning constraints under which all alternatives were formulated (i.e., bedrock profile, areas available in the park for a small-boat harbor, etc.), the harbor plan would destroy approximately 0.9 acre of a second wetland area located to the west of Cowles Creek (subsequently revised to 1.8 acres based on the redefined wetland boundries as presented in the U.S. Fish and Wildlife Service's Four-Season Study). The wetland area to the west of the parking lot (the wetland area of primary concern at Geneva State Park) would also be vulnerable to secondary impacts resulting from increased boat traffic. In addition, the aquatic ecosystem of Cowles Creek would be adversely effected by implementation of Plan 1.

6. Plan 3b, the tentatively selected plan, would initially cause destruction of approximately 2.3 acres of wetland and the completed harbor would be located contiguous to the remaining wetland area. However, a specific mitigation plan has been formulated to offset these environmental impacts with the result that the amount of wetlands-related fish and wildlife resources in existence at Geneva State Park under post-project conditions would equal or exceed that which currently exists. Thus, although Plan 3b would not enhance the natural environment at Geneva State Park, the plan would have minimal net impact on the environment and is the plan least damaging to the environment when compared to all plans considered in this Phase I Study.

GENERAL COUNSEL OF THE
UNITED STATES DEPARTMENT OF COMMERCE
Washington, D.C. 20230

JUL 21 1981

Colonel George P. Johnson
District Engineer
Buffalo District, Corps of Engineers
U.S. Department of the Army
1776 Niagara Street
Buffalo, New York 14207

Dear Colonel Johnson:

1 This is in reference to your draft environmental impact statement entitled, "small-boat harbor project at Geneva-on-the-Lake, Ashtabula County, Ohio." The enclosed comment from the National Oceanic and Atmospheric Administration (NOAA) is forwarded for your consideration.

Thank you for giving us an opportunity to provide this comment, which we hope will be of assistance to you. We would appreciate receiving four copies of the final statement.

Sincerely,

Robert T. Miki
Director of Regulatory Policy

Enclosure Memo From: Eugene J. Aubert
Great Lakes ERL
(NOAA)

U.S. DEPARTMENT OF COMMERCE (21 July 1981)

1. Thank you for your review. The comments from your agency are answered on the following pages. You will be sent the requested copies of the final report when it is available.

EXHIBIT E-18

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
ENVIRONMENTAL RESEARCH LABORATORIES
Great Lakes Environmental Research Laboratory
2300 Washtenaw Avenue
Ann Arbor, MI 48104

June 25, 1981

TO: PP/EC - Joyce Wood

FROM: RD/RF24 - Eugene J. Aubert

SUBJECT: DEIS 8105.18 - Geneva-on-the-Lake Small-Boat Harbor (Ohio)

The subject DEIS prepared by Corps of Engineers, Buffalo District, on proposed small craft harbor at Geneva State Park, Lake Erie, has been reviewed and comments herewith submitted.

The Draft Environmental Impact Statement presents four structural plans for the proposed small boat harbor at Geneva-on-the-Lake, Lake Erie. These four plans were preceded by an ititial screening of a wide variety of harbor locations and layouts. Finally, a Modified Wetland/Parking Lot Plan, alternative 3b, was tentatively selected as the best. Primary considerations for the selection of the best plan were to minimize negative impacts on the adjoining wetlands and existing parking lot.

2 Effects on Lake Erie shoreline were briefly discussed and indicated that all harbor alternatives would affect the accretion and erosion mechanisms in the immediate vicinity. However, accretion and erosion are not thought to be a significant problem (page 53) if a sand bypass is used. To prevent starvation of the down-drift shoreline, a six-inch sand bypass pipe was placed beneath the entrance channel of all four plans. Sand that accretes to the west of the harbor structure would periodically be pumped to the east for down-drift nourishment (page 48). No plan was found to make positive contribution to be recognized as Environmental Quality Plan, since there was no specific opportunity to improve the environment at Geneva State Park nor was there any identified need (page 104).

3 We consider that the evaluation of plans for the proposed harbor is incomplete without detailed evaluation of effects of individual harbor plans on the lake and shoreline environments. Our review disclosed that each alternative will produce significantly different impacts on the shoreline and that one plan will improve the shoreline to a large degree and that this plan should be selected as The Environmental Quality Plan. Our discussion will be *limited to the effects on the shoreline*.

1. Existing Shoreline Conditions. Geneva State Park on Lake Erie shore provides opportunity for swimming and sunbathing. However, the number of

U.S. DEPARTMENT OF COMMERCE (Cont'd)

2. Thank you for your review. Your individual comments are discussed below and on the pages following.

3. We disagree with your contentions that the effects of individual harbor plans were not evaluated in detail and that one plan would improve the shoreline. These points are addressed in the following responses.

swimming recreators has dropped dramatically since 1973 and has only partially recovered since then. It is postulated that the decrease in swimming recreators is a result of the loss of the beach area caused by high lake levels on Lake Erie since 1973 (page 29). The bathhouse in front of the beach is presently not being used to any great extent (Exhibit F-4, page 2). Prevailing littoral
4 transport in the vicinity of the park is from west to east. Based on wave energy, the Report estimates annual rates of the transport of 33,000 cubic yards from the west and 16,000 cubic yards from the east. At Cowles Creek, part of the littoral material is periodically diverted offshore forming an offshore delta.

2. Wetland/Parking Lot Plan (Alternative 3b). In this plan, harbor breakwaters will be placed approximately 1300 feet west of Cowles Creek. The predominant littoral drift from the west will be intercepted by the west
5 breakwater and deposited in front of it. The ongoing shoreline erosion west of the proposed harbor will be eliminated and, in place of eroded shoreline, a beach will form. Access to that beach is not planned due to existing wetlands in that vicinity.

In the reach of shoreline between the harbor structures and Cowles Creek, no littoral transport will exist. Harbor structures will intercept the transport from the west and Cowles Creek will intercept from the east. The shoreline will be starved of any sand supply, sand from the beach will disappear, and large increase in erosion will take place. Restoration and maintenance of the beach in front of the bathhouse will require expensive construction, such as a groin field, and periodic sand nourishment. A
6 portable sand bypass system was incorporated into the project. However, costs of construction and maintenance were not included in the estimate of construction costs and represented in the annual charges. Climatic conditions will dictate the operation of sand bypass and sand spreading to be scheduled during the heaviest use of the beach. East of Cowles Creek, shoreline erosion will also be increased although to a lesser degree. Beach maintenance will be required.

3. Cowles Creek Plan (Alternative 1). This plan would provide breakwaters on both sides of the mouth of Cowles Creek. Sand presently deposited in the creek and lost to the lake will be intercepted and utilized for beach formations. On the west side of west breakwater a dramatic change will take place. Instead of eroded shoreline, a beach in front of bathhouse will start forming and, with time, will develop into a beautiful beach of clean, well sorted, sand. Further west, beyond the Campbell Breakwater, present conditions will continue. It appears that a water control structure will not be needed. On the east side of the harbor, littoral drift from the east will be deposited at the east breakwater. Waves from the west will erode part of it and, as a result, only a small beach near the foot of the breakwater will remain. Further east, erosion probably will be slightly increased over the present. Due to the sand supply to both sides of the harbor, sand bypass can be deleted from the project.

Formation of an extensive beach in front of the bathhouse should be considered as a definite improvement in shoreline environment and the plan should be identified as an Environmental Quality Plan. It is suggested that this plan be subject to a detailed study with the aim of reducing impact on the parking lot. Hydraulic model studies should be conducted to select the best breakwater layout, both for emergency vessel entrance during storms and

U.S. DEPARTMENT OF COMMERCE (Cont'd)

4. The estimate of swimming recreators at Geneva State Park includes recreators at the beach east of Cowles Creek (Beach "B"). This beach has been and continues to be the more popular swimming area. However, becase of the large scale demand for additional public beaches along Lake Erie, the master plan for Geneva State Park includes creation of an additional beach in front of the bathhouse (Beach A). This area has historically (based on aerial photos back to 1938) been a headland which was fronted by minimal beach width. It should also be noted that the littoral drift estimate is based on the bluff recession rates to determine quantity, and the wave energy climate to determine the east vs. west drift relationship.

5. It is unlikely that a significant beach will develop west of the proposed harbor because of the plan to bypass any excess buildup.

6. A number of statements made in this paragraph are incorrect. Even with the Alternative 3b harbor structures in place, the shoreline immediately east of the structures will not be subjected to a large increase in erosion, for the following reasons: one-third of the gross sediment transport travels from east to west, and Cowles Creek only intercepts a small portion of this drift, during periods of heavy discharge only; the area in front of the bathhouse is already substantially protected by a State-constructed concrete revetment; the entrance channel breakwaters will shelter the shore in front of the bathhouse by shadowing it from waves from the west through northeast, and finally; the bypassing operations will maintain a nearly normal west to east transport rate. The preliminary hydraulic model study results from Plan 3b indicate that a buildup of sand is likely just east of the breakwaters, even without bypassing, due to a sheltering of the shore from the predominate westerly waves.

The sand bypassing operations costs have now been included in the estimate of annual charges for Plan 3b. Also, the sand bypassing is a land-based operation and therefore can be accomplished during limited beach use periods of early spring or late fall.

swimming recreators has dropped dramatically since 1973 and has only partially recovered since then. It is postulated that the decrease in swimming recreators is a result of the loss of the beach area caused by high lake levels on Lake Erie since 1973 (page 29). The bathhouse in front of the beach is presently not being used to any great extent (Exhibit F-4, page 2). Prevailing littoral transport in the vicinity of the park is from west to east. Based on wave energy, the Report estimates annual rates of the transport of 33,000 cubic yards from the west and 16,000 cubic yards from the east. At Cowles Creek, part of the littoral material is periodically diverted offshore forming an offshore delta.

2. Wetland/Parking Lot Plan (Alternative 3b). In this plan, harbor breakwaters will be placed approximately 1300 feet west of Cowles Creek. The predominant littoral drift from the west will be intercepted by the west breakwater and deposited in front of it. The ongoing shoreline erosion west of the proposed harbor will be eliminated and, in place of eroded shoreline, a beach will form. Access to that beach is not planned due to existing wetlands in that vicinity.

In the reach of shoreline between the harbor structures and Cowles Creek, no littoral transport will exist. Harbor structures will intercept the transport from the west and Cowles Creek will intercept from the east. The shoreline will be starved of any sand supply, sand from the beach will disappear, and large increase in erosion will take place. Restoration and maintenance of the beach in front of the bathhouse will require expensive construction, such as a groin field, and periodic sand nourishment. A portable sand bypass system was incorporated into the project. However, costs of construction and maintenance were not included in the estimate of construction costs and represented in the annual charges. Climatic conditions will dictate the operation of sand bypass and sand spreading to be scheduled during the heaviest use of the beach. East of Cowles Creek, shoreline erosion will also be increased although to a lesser degree. Beach maintenance will be required.

7 3. Cowles Creek Plan (Alternative 1). This plan would provide breakwaters on both sides of the mouth of Cowles Creek. Sand presently deposited in the creek and lost to the lake will be intercepted and utilized for beach formations. On the west side of west breakwater a dramatic change will take place. Instead of eroded shoreline, a beach in front of bathhouse will start forming and, with time, will develop into a beautiful beach of clean, well sorted, sand. Further west, beyond the Campbell Breakwater, present conditions will continue. It appears that a water control structure will not be needed. On the east side of the harbor, littoral drift from the east will be deposited at the east breakwater. Waves from the west will erode part of it and, as a result, only a small beach near the foot of the breakwater will remain. Further east, erosion probably will be slightly increased over the present. Due to the sand supply to both sides of the harbor, sand bypass can be deleted from the project.

8 Formation of an extensive beach in front of the bathhouse should be considered as a definite improvement in shoreline environment and the plan should be identified as an Environmental Quality Plan. It is suggested that this plan be subject to a detailed study with the aim of reducing impact on the parking lot. Hydraulic model studies should be conducted to select the best breakwater layout, both for emergency vessel entrance during storms and

U.S. DEPARTMENT OF COMMERCE (Cont'd)

7. To prevent starvation of the downdrift shoreline, a sand bypassing system was incorporated into all alternative harbor plans formulated for this Phase I study, including the Cowles Creek Harbor Plan (Plan 1). Therefore, littoral drift deposited on the updrift side of the breakwaters for Plan 1 would be periodically pumped to the east and a permanent beach would not form in front of the bathhouse. If sand bypassing were not included in Plan 1, in order to aid in forming a beach in front of the bathhouse, approximately 15,000 cubic yards of sand would have to be purchased annually and placed into the littoral system east of the harbor structures to avoid a significant increase in shoreline erosion. This is of particular concern at Geneva State Park since the shoreline to the east of Cowles Creek is highly erosive and unprotected and includes not only Beach "B" (the more popular swimming area at the present time), but also a major picnic ground. It should also be noted that the total cost for constructing a new beach in front of the bathhouse, including annual downdrift nourishment costs, would be similar for Plans 1 and 3b, since the cost of the additional structures required with Plan 3b (ie: offshore brekwaters, groins, etc.) would be offset by the added annual charge required for Plan 1 for purchasing an additional 15,000 cubic yards of sand to prevent increased shoreline erosion to the east. In addition, preliminary results from the hydraulic model study for Plan 3b indicate that a buildup of sand is likely just east of the breakwaters due to a sheltering of the shore from the predominate westerly waves, further reducing the need for additional beach building structures with Plan 3b. It should also be noted that although some littoral material is diverted offshore at Cowles Creek to form an offshore delta, Cowles Creek is probably a minor agent of offshore transport (see Appendix B of the Reformulation General Design Memorandum and EIS). During most of the year the mouth of Cowles Creek is almost totally blocked by a littorally deposited spit (bar), particularly during the littorally active fall when fluvial discharge is typically quite low.

8. As previously stated, a sand bypassing system was included in Plan 1 to prevent starvation of the downdrift shoreline. Therefore, since a beach would not form in front of the bathhouse, Plan 1 cannot be identified as the Environmental Quality Plan because it will not make net positive contributions to the EQ account. In addition, because sand bypassing would be a periodic operation there is a risk of instantaneous erosion to downdrift shores during severe storms. With Plan 3b, the immediate downdrift shoreline is protected by a concrete revetment which would prevent shoreline erosion. However, with Plan 1, the immediate downdrift shoreline is highly erosive and unprotected and there is no assurance that there will not be an increase in shoreline erosion between bypassing operations. Thus, in terms of maintaining the present shoreline, Plan 3b is superior to Plan 1. A hydraulic model study of Plan 1, which would be of no practical value, will not be conducted.

for reduction of waves inside the harbor.

4. Conclusions. The Draft Environmental Impact Statement is incomplete, since the discussion does not recognize differences in impacts on Lake Erie shoreline from various harbor locations. Examination of data available in the Statement reveals large disparity between the impacts of the two harbor plans. The Cowles Creek Plan would improve the shoreline by creating extensive
9 beach in front of the bathhouse and eliminate the need of sand bypass operations. The Wetland/Parking Lot Plan would create a beach in a location not easily accessible to the public. Costs of maintaining a beach in front of the bathhouse would be high and should be included in the cost estimate. The cost advantage of the latter plan could then disappear, making the Cowles Creek Plan superior in all aspects.

U.S. DEPARTMENT OF COMMERCE (Cont'd)

9. The Draft General Design Memorandum does discuss the Coastal Processes in Appendix B. Detailed discussion of the various alternative plans was only developed to the following level due to the conclusion that bypassing will eliminate long-term shoreline impacts regardless of the plan (see page B-8):

"...Alternative 1, the bluff area to the east of the proposed structures may experience accelerated erosion between bypassing operations. Alternatives 2, 3, 3b, and 4 should have limited downdrift impacts since the area to the east is already protected by a revetment."

The reviewer is referred to the placement of the GDM and EIS together as a combined document. Development of the design and project logic is actually done throughout the GDM. The EIS is a summary and interpretation of those aspects of the viable project alternatives which represent a potential environmental impact. Because of the inclusion of a sand bypass system, the selected plan (the only alternative which was developed in detail and which was thus the subject of intensive environmental impact analysis) would have no substantial net impact on the shoreline. Therefore, the EIS is complete without an in-depth discussion of shoreline resources and impacts. There are, however, negative shoreline impacts attributable to Alternative 1, and this information has now been added to Table 1, Comparative Impacts of Alternatives (p. FEIS 19), and further incorporated into the EIS by index reference to Appendix B. The Cowles Creek plan would create no more beach then would the Wetlands/Parking Lot plan. The main difference is where the beach is located and where the concentrated erosion would occur. The programmed sand bypassing will greatly limit the extent of fillet beach development in both cases. The difference is that the area downdrift of Alternative 3b is already substantially protected whereas the area downdrift of Alternative 1 is an unprotected highly unstable shore which can be damaged by storms between bypassing operations. As stated in the GDM, the Cowles Creek Plan is deficient relative to the Wetland/Parking Lot Plan because it is more expensive to build, is more dangerous to neighboring shores, severs the recreational facilities of the park, will involve more hazardous entrance channel conditions for boaters, will be more expensive to maintain due to the need to dredge Cowles Creek sediments, and could result in water quality problems.

United States Department of the Interior

OFFICE OF THE SECRETARY
NORTH CENTRAL REGION
175 WEST JACKSON BOULEVARD
CHICAGO, ILLINOIS 60604

ER 81/1021

July 24, 1981

Colonel George P. Johnson
District Engineer
Buffalo District, Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Dear Colonel Johnson:

1 The Department of the Interior has reviewed the draft reformation Phase I GDM and draft environmental impact statement (combined) for a small boat Harbor at Geneva-on-the-Lake, Ashtabula County, Ohio. The following comments are provided for your consideration.

General Comments

2 Geology and mineral resources have been studied, and a detailed assessment *is contained in Appendix A of the report. Effects of proposed construction* on mineral resources are likely to be negligible. The Draft EIS - Section 6, pages DEIS 22-25, fails to mention mineral resources as a significant resource of the affected environment. Lime, sand and gravel are produced in nearby areas, although not in the project area. For completeness, a statement to this effect should be incorporated in the environmental statement. The final environmental statement should i 'cate source and adequacy of the water supply for the public dock facilities (p. DEIS 14, par 2.06).

3 The document is adequate in its assessment and evaluation of existing environmental conditions and anticipated impacts of the selected harbor plan. The U.S. Fish and Wildlife Service's concerns and recommendations expressed in a number of workshops, the Planning Aid Letter of May 15, 1978, and the Final Fish and Wildlife Coordination Act Report of October 1980 have been addressed. We are pleased the General Design Memorandum contains a recommendation that specific actions, which maintenance of the "mitigation plan" would entail, be specified and included as items in the Local Cooperation Agreement with the State of Ohio. We are particularly pleased to see that a walkway will be included on the east breakwater to facilitate fishermen access.

Sincerely yours,

Sheila Minor Huff

Sheila Minor Huff
Regional Environmental Officer

EXHIBIT E-19

U.S. DEPARTMENT OF THE INTERIOR (24 July 1981)

1. Thank you for your review.

2. The information you provided and requested has been added to the FEIS. Mineral resources are discussed on page FEIS 24, and water supply on page FEIS 14.

3. Thank you for your comment.

STATE CLEARINGHOUSE

3' EAST BROAD STREET • 39TH FLOOR • COLUMBUS, OHIO 43215 • 614 / 466-7461

81-06-29 P
09

George P. Johnson, Colonel
U. S. Department of the Army
Buffalo District, Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

RE: Review of Environmental Impact Statement/Assessment
Title: Draft Reformulation Phase I, General Design Memorandum and Draft Environmental Impact Statement, Geneva-on-the-Lake, Ohio, Small-Boat Harbor
SAI Number: 36-422-0013

Dear Colonel Johnson:

The State Clearinghouse coordinated the review of the above referenced environmental impact statement/assessment.

1 This environmental report was reviewed by all interested State agencies. We have been advised by the Ohio Department of Natural Resources that their agency will be responding on this particular project, however, their response will be sent directly to your office. No other reviewers have stated concerns relating to this report.

Thank you for the opportunity to review this statement/assessment.

Sincerely,

Judith Y. Brachman

Judith Y. Brachman
Administering Officer

JYB:lew

cc: DNR, Mike Colvin
EPA, Beth Whitman

EXHIBIT E-20

OHIO STATE CLEARINGHOUSE (29 JUNE 1981)

1. Thank you for your review. No response necessary.

ODNR

Ohio Department of Natural Resources

OFFICE OF CHIEF ENGINEER
Fountain Square · Columbus Ohio 43224 · (614) 466-4633

July 21, 1981

U.S. Army Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Attention: Richard Aguglia

Dear Sir:

1 This department has reviewed the general design memorandum and the draft environmental statement for the Geneva-On-The-Lake Small Boat Harbor project- Geneva State Park.

The department has been coordinating the development of these plans since the project inception and we concur with the contents of the design memorandum and draft statement as prepared.

Sincerely,

JAMES A. SWARTZMILLER
CHIEF ENGINEER

JAS:bm
cc: R.L. Lucas

OHIO DEPARTMENT OF NATURAL RESOURCES (21 July 1981)

1. Thank you for your review. No response necessary.

EXHIBIT E-21

APPENDIX F

PUBLIC INVOLVEMENT

GENEVA-ON-THE-LAKE SMALL-BOAT HARBOR

FINAL REFORMULATION PHASE I GENERAL DESIGN MEMORANDUM

U. S. Army Engineer District, Buffalo
1776 Niagara Street
Buffalo, NY 14207

APPENDIX F

PUBLIC INVOLVEMENT

Exhibit F-1	Summary Minutes of 15 December 1977 Workshop Meeting
Exhibit F-2a	Preliminary Section 404 Evaluation and Public Notice (30 October 1980)
Exhibit F-2b	Final Section 404 Evaluation (July 1981)
Exhibit F-2c	Section 401 Water Quality Certification from Ohio Environmental Protection Agency, dated 21 July 1981 for the Geneva-on-the-Lake Small-Boat Harbor Project.
Exhibit F-3	Summary Minutes of 18 January 1979 Workshop Meeting
Exhibit F-4	Summary Minutes of 29 May 1979 Workshop Meeting
Exhibit F-5	Summary Minutes of 26 June 1980 Workshop Meeting
Exhibit F-6	Summary Minutes of 27 June 1980 Workshop Meeting
Exhibit F-7	Summary Minutes of 23 July 1980 Workshop Meeting

AD-A104 866 CORPS OF ENGINEERS BUFFALO NY BUFFALO DISTRICT F/G 13/2
GENEVA-ON-THE-LAKE, OHIO. SMALL-BOAT HARBOR. FINAL REFORMULATIO--ETC(U)
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SUMMARY MINUTES OF 15 DECEMBER 1977
MEETING CONCERNING GENEVA-ON-THE-LAKE
SMALL BOAT HARBOR

A meeting was held at the Ohio Department of Natural Resources office in Columbus, OH, on 15 December 1977 to discuss the Geneva-on-the-Lake Small Boat Harbor. The names of the persons attending are on the attached list. Chuck Gilbert opened the meeting stating that the purpose of the meeting was to discuss some of the potential problems regarding the project for input to the Plan of Study which will be completed in April 1978.

Mel Rebholz stated that the project has a high priority in their department and that funds are available for the project under the capitol improvement bill. Ralph Henry stated that one of the primary items to be addressed is the location of the harbor in the park. There could be some major environmental problems in the proposed area. Also, the existing parking lot may require relocating the harbor site and this would result in increased construction cost if rock excavation is required.

James Swartzmiller stated that they do not want to remove the parking lot because it would reduce access to the beach area. He felt that the harbor could be moved west and still maintain the original capacity.

Denton Clark stated that rock probings indicate a high rock surface elevation to the south and west of the original harbor site. He stated

EXHIBIT F-1

that a geophysical study should be conducted in the area. There are indications of another bedrock trough in the Cowles Creek area and this should be considered as an alternative site.

Chuck Gilbert stated that consideration should be given to an off-shore harbor or acquisition of additional land for another harbor site.

James Swartzmiller stated that they do not want to acquire any additional land and are not opposed to an off-shore harbor.

John Zorich asked if the harbor configuration could be changed to allow the harbor to remain in the same area without requiring rock excavation. He also asked if the structure of the rock would prevent excavation without blasting. Denton Clark replied that the rock problem was the reason for the original design of the harbor in the survey report and does not know how difficult it would be to excavate the rock.

James Swartzmiller stated that the rock structure seemed very hard when they were driving pilings for other work in the area.

Denton Clark stated he believes the original plan should be used if the environmental problems can be remedied along with use of some of the parking area.

James Swartzmiller stated he is opposed to removing the parking lot or a large part of the parking lot because it would hinder use of the beach facilities. He felt that better rock data should be obtained

and then determine the benefits and costs of the new site before ruling out the area west of the original location. He also stated that the Cowles Creek area and an off-shore harbor should be considered.

Chuck Gilbert stated that an off-shore harbor would have much greater costs than the inland harbor based on studies for Port Ontario small boat harbor.

Fred Ball asked if the capacity of harbor could be reduced from the original capacity of 400 boats. Chuck Gilbert replied that the capacity could be reduced, however, a favorable benefit/cost ratio would still be necessary and reducing the capacity reduces the benefits.

Denton Clark asked if there are any problems in the Cowles Creek area. Fred Ball replied that there is a large number of trees in this area and more excavation would be required because of the higher terrain.

Chuck Gilbert asked if there is still a pollution problem in Cowles Creek from the sewage treatment plant. James Swartzmiller replied that the plant has been partially cleaned up and should not be a problem.

Bob Owens asked if the wetlands would be destroyed by the project and has any environmental assessment been done. Roger Hubbell replied that no environmental assessment has been made.

Ellen Cummings stated that the ponds were created by borrow excavation for the parking areas, so the area was previously disturbed.

Bob Owens stated that how the wetlands were created would not effect Fish and Wildlife's decisions. Mitigation may be necessary.

Mel Rebholz stated that ODNR is not opposed to mitigation.

Chuck Gilbert asked what areas of the park should not be considered for the harbor site. Roger Hubbell replied that the area west of the marina will be used for camp grounds. The eastern area has very high banks and is a picnic area. There does not appear to be much available space other than Cowles Creek and the original proposed area.

Denton Clark stated that his observations of wave action in the area indicate a high bedrock elevation. He asked if Arcola Creek should be considered as an alternative site. It was a considered site in the survey studies. Mel Rebholz replied that a regional sewage treatment development will be taking place in the area and does not believe this area should now be considered.

Norv Hall asked that if the rock problem is resolved, would the environmental situation prevent construction of the harbor. Bob Owens replied that it would depend upon the impact on the marsh. They would oppose the project if the marsh is destroyed, but would consider mitigation.

John Zorich asked if the productivity of the marsh is considered. Could the marsh be reduced if the productivity of the remaining area is increased. Bob Owens replied that this could be an acceptable solution.

Ellen Cummings stated that a field trip had been scheduled for 7 December with F&WL to look at the site, but had been cancelled because of snow.

Bob Owens stated that F&WL would not be able to visit the site until spring. John Zorich asked if ODNR has any environmental data for the area. Mel Rebholz replied that he does not believe there is any available information.

Denton Clark asked if ODNR would be willing to give up some of the parking lot if the Cowles Creek area is considered. James Swartzmiller replied that he had no objection to looking at the Cowles Creek area for the harbor. Mel Rebholz stated he had no objection to the Cowles Creek area. They had not considered it before because of the high ground.

Chuck Gilbert asked if the spoil from the harbor excavation area could be utilized constructively elsewhere in the park. Mel Rebholz replied that they don't know of any use for the material right now.

Fred Ball stated he feels the Cowles Creek site would split the beach area.

John Zorich asked if ODNR's geological department has any information on the rock structure in the area. Mel Rebholz replied that their data would not show enough detail.

John Zorich asked how high the proposed breakwaters would have to be raised in order to construct an off-shore harbor. Denton Clark replied that he would estimate about five additional feet above the authorized breakwater elevation.

Chuck Gilbert stated that because of the high cost for an off-shore facility it is difficult to justify the project.

Ellen Cummings asked if ODNR has an estimate of the needed capacity for the harbor. Norv Hall replied that they have an estimate of 250 boats but this is a rough estimate.

Denton Clark asked if people in the area are not buying boats because of lack of facilities. Norv Hall replied that he is not aware of this situation.

Ellen Cummings asked if they have an estimate of user days for recreational fishing. Norv Hall replied that they have information on this and will forward it to the Buffalo District.

Chuck Gilbert stated that recreational boat fishing should be considered as a benefit for the project also.

James Swartzmiller asked why the benefits for a harbor of refuge are only $10,000. Chuck Gilbert stated that there is no information available on what damages could have been prevented if a harbor of refuge

exists. The amount of $10,000 was used by the Corps at time the project was authorized and has not been changed.

James Swartzmiller stated he believes harbor of refuge is a very important aspect of the harbor and that he will gather some information on this.

Chuck Gilbert stated we would need past damage or possible loss of life information in order to increase the harbor of refuge benefits. He then asked if ODNR believes commercial fishing should be considered at the harbor.

Tom Goettke stated he is not familiar with any commercial fishing in the area. Because Ohio is developing stream fishing rather than Lake Erie fishing, the coho fishing is mainly confined to the streams. He does not believe charter fishing on Lake Erie would be established in the area because the more desirable sport fish are not in that area.

Horace Collins presented the available data on rock elevations in the area which did not have the detail necessary for plan formulation evaluation of alternative harbor sites.

He thought the rock information could be obtained with either a hand or power auger. He stated that shale is the predominant rock formation in the area and could possibly be excavated without excessive costs.

John Zorich stated that the rock elevation data should be done early in the study and that the proposed plan be rescaled to determine the exact area needed for the harbor. Ellen Cummings asked if the benefit/cost ratio could be less than one for the project. Chuck Gilbert replied that a NED plan would have to be developed with a favorable benefit/cost ratio but the selected plan could have a B/C ratio less than one if environmental enhancement results outweigh the change in benefits.

John Zorich asked if ODNR has an indication of the local residents opinion toward the harbor. Norv Hall replied that the local people are very much in favor of the project.

Chuck Gilbert asked if ODNR would provide Buffalo District with the names of interested people for addition to the mailing list. Norv Hall stated they would provide the list.

John Zorich stated that a public meeting is tentatively scheduled for February or March of 1978.

Chuck Gilbert asked if ODNR could provide Buffalo District with information on the fleet mix expected at the harbor. Norv Hall stated this information will be provided.

Denton Clark asked if ODNR knew of a facility in the area where a public meeting could be held. James Swartzmiller stated that the Geneva High School could probably be used.

Ellen Cummings asked if there are any records of attendance at the park. Tom Goettke stated that there is some information available and will forward the data to Buffalo District.

John Zorich asked if the proposed six foot depth in the mooring area is suitable. Norv Hall replied that six feet should be sufficient and could possibly be reduced in the mooring area for some boats.

John Zorich asked if a sight-seeing craft might base at the harbor and be included in the benefits. Chuck Gilbert stated this could be included as a project benefit. Norv Hall stated he does not believe this type of activity would be established at this area.

Ralph Henry asked if ODNR has an idea of the maximum amount of funds available for construction of the harbor. Norv Hall replied that he believes the upper limit would be around 2.5 million.

John Zorich asked if an explanation of the Corps planning process would be beneficial to those present. The ODNR representatives indicated they are aware of the Corps process and did not want further explanation.

Chuck Gilbert asked if ODNR has an area where spoil could be used. Roger Hubbell stated that some material could be used in the camp ground area.

Chuck Gilbert briefly summarized the meeting stating that two locations appear likely, the area immediately west of the original proposed location and at Cowles Creek. There does not appear to be a need for commerc

fishing facilities. ODNR will provide Buffalo District information on: the expected size and composition of the fleet, addresses of local interests, support for harbor of refuge benefits, and information on the State's fishing program. Spoil material may be used in the camp ground area. The upper limit of funds for the project would be about 2.5 million. The coordinator for the project will be James Swartzmiller. There is no environmental data available for the area. Fish and Wildlife probably could not visit the site until April or May.

John Zorich asked if there is any information available on the use of the launching ramp east of the park. Norv Hall stated he would obtain the information.

John Zorich asked if F&WL has performed a literature search for the area. Bob Owens replied that he did not know of anything being done on this, but would check with others in his office. John Zorich stated that the model study will not be initiated until the summer of 1979 when plan formulation is complete.

Denton Clark stated that the present breakwater configuration would be harmful to the downdrift area. The west breakwater should run more parallel to the shore and the east breakwater should be longer. A sand by-pass system would probably be recommended. A minimum of littoral information would be obtained from the model.

Brian Troyer stated that one of the items of local cooperation is for local interests to provide an area for spoil disposal for both construction and maintenance. Probably an upland disposal site would be required.

Ellen Cummings asked if any water quality data is available. Norv Hall stated that some data may be available from the park.

John Zorich asked if there would be any problem in obtaining access to the park for surveys. James Swartzmiller stated there would be no access problems.

Chuck Gilbert closed the meeting indicating that site location would be the primary investigative effort.

for RALPH HENRY
Project Manager

MEETING 15 DECEMBER 1977 COLUMBUS, OH
OHIO DEPARTMENT OF NATURAL RESOURCES
GENEVA SMALL BOAT HARBOR
GENEVA-ON-THE-LAKE, OH

James Swartzmiller	ODNR
Fred B. Ball	ODNR
Tom Goettke	ODNR
Steven H. Cole	ODNR - Division of Wildlife
Ralph Henry	Corps of Engineers, Buffalo
John Zorich	Corps of Engineers, Buffalo
Robert A. Owens	U.S. Fish & Wildlife Serv., East Lansing
Brian M. Trover	Corps of Engineers, Buffalo
Ellen M. Cummings	Corps of Engineers, Buffalo
Norv Hall	ODNR
Charles E. Gilbert	Corps of Engineers, Buffalo
Denton R. Clark, Jr.	Corps of Engineers, Buffalo
Mel Rebholz	ODNR
Rober Hubbell	ODNR
Horace R. Collins	ODNR

DEPARTMENT OF THE ARMY
BUFFALO DISTRICT, CORPS OF ENGINEERS
1776 NIAGARA STREET
BUFFALO, NEW YORK 14207

PUBLIC NOTICE

30 October 1980

SMALL-BOAT HARBOR PROJECT
GENEVA-ON-THE-LAKE, ASHTABULA COUNTY, OHIO

1. This Public Notice has been prepared and distributed to identify what dredged or fill materials would be discharged into waters of the United States by implementation of the proposed project, and to provide an opportunity for any person affected by such discharge of materials to request a public hearing.

2. Authorization - Section 6 of Public Law 79-14, approved 2 March 1945, authorized and directed the Secretary of War to cause preliminary examination and surveys to be made on the south shore of Lake Erie, with a view to the establishment of harbors and harbors-of-refuge for light draft commercial and fishing vessels and for recreational craft. In partial compliance with this authority, a comprehensive preliminary examination report, favorable to 33 locations on the coast of Lake Erie, was submitted on 19 July 1946. Preparation of survey reports thereon was authorized by the Chief of Engineers on 20 December 1946.

An Interim Report completed in February 1969 examined the feasibility of constructing a small-boat harbor at Geneva-on-the-Lake, OH, which was being developed as a State Park. The Geneva-on-the-Lake site, not originally included in the 1946 preliminary examination report, is a substitute site for Arcola Creek, located 2 miles west of Geneva State Park.

The Interim Report gave a favorable recommendation for the harbor project and the results were published in House Document No. 91-402. The project was subsequently authorized for construction under Section 201 of the 1965 Flood Control Act (Public Law 89-298) by the House and Senate Committees on Public Works by resolutions dated 15 December 1970 and 17 December 1970, respectively. Funds to initiate the Advanced Engineering and Design of the project were appropriated in Fiscal Year 1978. As originally authorized, the project would have directly situated the boat harbor on an area which is now nearly entirely occupied by wetlands and park facilities. The amount of destruction of these important natural and man-made features have rendered this originally authorized harbor location infeasible. A Reformulation Phase I General Design Memorandum Study is currently being performed with the objective of identifying a viable plan.

3. Reports and Recommendations - The Stage 2 Document for Reformulation Phase I General Design Memorandum for the Geneva-on-the Lake Small-Boat Harbor project which was issued by the Buffalo District in July 1979, and revised in April 1980, presents the components of the Stage 2 planning effort conducted to identify and analyze a wide range of alternatives.

EXHIBIT F-2a

The report reaffirms the apparent potential viability of a small-boat harbor project in terms of economic, environmental, and engineering considerations and concludes with a recommendation that the study be continued into Stage 3 Planning (Development of Detailed Plans). A Draft Phase I General Design Memorandum, including a Draft Environmental Impact Statement is scheduled to be released in June 1981. This report will present the results of the Stage 3 Planning effort, including a tentatively selected plan and its distribution will constitute the initiation of systematic and thorough public review of the study.

4. Based upon technical, environmental, and economic criteria, as well as significant public input, I have concluded that it is in the best public interest to recommend Alternative 3b, the Wetlands/Parking Lot Plan (Modified) as the tentatively selected plan. This plan would provide a 360-slip all-weather harbor located within Geneva State Park, on land which is partly a wetland area and partly parking and lawn areas. The harbor entrance would be protected by a pair of shore-connected rubblemound breakwaters extending into Lake Erie. Environmental mitigation measures have been developed for implementation, and have been incorporated into the project plan. These measures would provide and maintain wetland conditions on an acreage greater than that which would be destroyed by construction of the boat harbor.

5. The Section 404 discharges which have been proposed as part of the Geneva-on-the-Lake project include the following materials:

Use and Location	Type and Quantity
a. Entrance Channel Breakwaters extending into Lake Erie	16,000 tons of rubblemound armor stone 5,200 tons of bedding stone 2,400 tons of underlayer stone
b. Entrance Channel Dredged Material to be placed upland and alongshore	4,000 cubic yards of sand and rock fragments
c. Mooring Area Periphery Stabilization Material	4,250 cubic yards (8,500 square yards) of riprap material 40,500 square feet of diaphragm cell steel pile in-place
d. Wetland Construction in borrow pits (Ponds "A" and "B")	31,000 cubic yards of unpolluted excavated material
e. Water Control Structure at mouth of marsh creek	30 cubic yards of concrete 332 square feet of sheet steel 500 cubic yards excavated for spillway

f. Impermeable Boundary Layer between wetlands and mooring area — 6,500 cubic yards of sand, gravel, and rock cobbles with a clay matrix

A preliminary Section 404 Evaluation of the impact of these discharges upon water quality has been prepared and is attached.

6. This proposed project involves the discharge of dredged and fill material into the waters of the United States. Therefore, the evaluation of the impact of the activity on the public interest includes application of the guidelines promulgated by the administrator of the U. S. Environmental Protection Agency, 40 CFR Part 230, under the authority of Section 404(b) of the Clean Water Act. Any person who has an interest which might be affected by the proposed discharge may request a public hearing. The request must be submitted in writing to the District Engineer within 30 days of the date of this notice and must clearly state the interest which may be affected and the manner in which the interest may be affected by this activity.

1 Incl
as stated

GEORGE P. JOHNSON
Colonel, Corps of Engineers
District Engineer

NOTICE TO POSTMASTER: It is requested that the above notice be conspicuously displayed for 30 days from the date of issuance.

PRELIMINARY

SECTION 404 EVALUATION
SMALL-BOAT HARBOR
GENEVA-ON-THE-LAKE,
ASHTABULA COUNTY, OHIO

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PRELIMINARY

SECTION 404 EVALUATION
SMALL-BOAT HARBOR
GENEVA-ON-THE-LAKE,
ASHTABULA COUNTY, OHIO

1. Project Description.

1.1 The Tentatively Selected Plan. The Preferred Plan for the Geneva-on-the-Lake Small-Boat Harbor project is that alternative known as the Wetlands/Parking Lot Harbor Plan (Alternative 3b). This plan (illustrated on Plate 1) would provide a 360-slip all-weather harbor located within Geneva State Park, at the south shore of Lake Erie, on land which is partly a wetland area and partly parking and lawn areas. Environmental mitigation measures have been developed for implementation, and have been incorporated into the project plan. These measures would provide and maintain wetland conditions on an acreage greater than that which would be destroyed by construction of the boat harbor.

1.2 The small-boat harbor mooring area and harbor-of-refuge would occupy roughly 15.6 acres inland near the shore. It would be connected with Lake Erie via an entrance channel 100 feet wide and 400 feet long, which would be protected by a pair of rubblemound breakwaters extending into Lake Erie.

1.3 The plan would initially cause a considerable amount of irreversible wetlands destruction. The harbor is planned to be situated on an area which includes 2.2 acres of wet meadow, shallow marsh, and deep marsh combined. (There is a total of 6.6 acres of wet meadow and marsh in the immediate vicinity of the proposed project; this herbaceous wetland is part of a marsh/swamp complex of roughly 9.6 acres.) The completed harbor would be located contiguous to the remaining wetland area. Mitigation, through replacement in kind, by creating wetland conditions on an acreage greater than that of the wetlands lost by harbor construction is planned for the project. This includes: (1) placement of excavated material in an existing somewhat deep sparsely vegetated borrow pit to create a water level which will be conducive to the establishment of abundant wetland plant life; (2) enlargement, using excavated material, of an existing island in a second borrow pit, to favor the establishment of nesting waterfowl there; (3) construction of a water level control device and establishment of a program to regulate water levels in the entire marsh/swamp complex to maintain wetland environmental conditions, and (4) planting of a shrub barrier between the boat harbor and the wetlands to minimize disturbance reaching the wetlands. The result of these environmental mitigation measures will be that the area of wetlands in existence at Geneva State Park under post-project conditions will equal or exceed that which currently exists.

1.4 Section 404 Discharges. Legal requirements of Section 404 of the Clean Water Act (33 USC 1344), require the evaluation of the effects upon water quality of the disposal of dredged or fill materials into navigable

waters of the United States. This preliminary evaluation for the proposed Geneva-on-the-Lake Small-Boat Harbor project has been prepared using the general guidance contained in EC 1105-2-97, dated 8 May 1979, "Implementation of the Clean Water Act," and is being coordinated with the public in conformance with guidance contained in NCDPD-ER letter, dated 4 September 1979, "Public Coordination of Section 404(b)(1) Evaluations on Civil Works Projects." The first reference provides guidance on the content of Section 404(b)(1) Evaluations while the second reference states that a public notice, with attached preliminary Section 404 Evaluation, should be issued at the earliest possible time before completion of the Final Environmental Impact Statement.

1.5 The materials to be discharged into the waters of the United States for the proposed Geneva-on-the-Lake project include the following:

Use and Location		Type and Quantity
a. Entrance Channel Breakwaters extending into Lake Erie	-	16,000 tons of rubblemound armor stone 5,200 tons of bedding stone 2,400 tons of underlayer stone
b. Entrance Channel Dredged Material to be placed upland and along shore	-	4,000 cubic yards of sand and rock fragments
c. Mooring Area Periphery Stabilization Material	-	4,250 cubic yards (8,500 square yards) of riprap material 40,500 square feet of diaphragm cell steel pile in place
d. Wetland Construction in borrow pits (Ponds "A" and "B")	-	31,000 cubic yards of unpolluted excavated material
e. Water Control Structure at mouth of marsh creek	-	30 cubic yards of concrete 332 square feet of sheet steel 500 cubic yards excavated for spillway
f. Impermeable Boundary Layer between wetlands and mooring area	-	6,500 cubic yards of sand, gravel, and cobbles in a clay matrix

1.6 Source of Materials. The rubblemound stone, riprap stone, and bedding stone to be used in constructing the breakwaters and in stabilizing the periphery of the mooring area would be obtained from a commercial quarry. The actual location of the quarry would be determined at the time of construction of the project. The source of construction materials for the water control structure and the steel used for the mooring area walls would be determined by the Contractor in conformance with Government specifications for the materials. The material to be used in wetlands creation would be obtained from the portion of the future mooring area which is currently

occupied by marsh or wet meadow. The impermeable fill material at the wetlands-mooring area border, would be excavated material from the site of the future mooring area. Fill material for grading the slopes surrounding the water control structure will be obtained from material excavated for the spillway.

2. The Discharge and Discharge Sites.

2.1 Location, Bathymetry and Methods of Discharge. The discharges into waters of the United States include the materials listed as (a) through (f) in paragraph 1.5 above. For specific locations of each of these discharges, refer to Plate 1 and the following which includes a description of the site bathymetry, the discharge methods, and also includes introductory information where appropriate.

a. Entrance Channel Breakwaters: Location and Bathymetry - These are planned to be a pair of shore-connected structures extending into Lake Erie in arrowhead fashion, with the distance between them to be 150 feet at the lakeward ends, and 800 feet at the shoreward ends. They would flank both the proposed entrance channel to the harbor and the portion of the shore which includes the hydrologic connection between the marsh/swamp complex and Lake Erie (the marsh creek). They would be constructed across the shallow littoral zone of Lake Erie extending from the shore to a depth of 8 feet below Low Water Datum (LWD), which for Lake Erie is elevation 568.6 feet above mean water level at Father Point, Quebec, International Great Lakes Datum (IGLD 1955). The existing substrates here are predominantly sand and shale fragments with small amounts of silt.

Discharge Method - The stone used for construction of the navigation structures would be brought to the area on barges and be placed by water-based cranes into the waters of Lake Erie.

b. Entrance Channel Dredged Material: Location and Bathymetry - This material would consist of two components: sand and rock fragments. The former is the unconsolidated bottom material in the nearshore region which thinly overlies bedrock. The latter is the bedrock which would need to be loosened and removed during excavation of an entrance channel with a bottom depth of 8 feet below LWD. The sand would be placed on the shore in the lee of the east breakwater, to aid in beach building.

Discharge Method - The rock would be placed at an upland site within the park. Dredging and sand placement would be accomplished with a water-based clamshell dredge. Bedrock would be loosened with explosives.

c. Mooring Area Periphery Stabilization Structures: Location and Bathymetry - Current plans call for the west side of the mooring area and the northeast wall of the marina bordering the entrance channel to be of riprap stone material, with a 1 on 3 slope, and the north, south, and east sides of the mooring basin to be vertical walls of diaphragm cell steel pile construction. This combination and configuration of materials is tentative, depending upon the results of wave-action model tests currently being performed by the Corps Waterways Experiment Station. The objective of these

tests is to ensure a harbor design with an acceptably low amount of internal wave action, which is related to the wave absorbing and reflecting properties of the sides of the mooring basin. Riprapped side slopes would have a pitch of one vertical unit for each three horizontal units (a 1 on 3 slope). The riprap stone slope would have the toe end in a depth of 8 feet below LWD along the entrance channel and mooring (refuge) area and 6 feet below LWD along the inner channels. The crest of the west wall would be at an elevation of 8 feet above LWD and the crest of the northeast wall of the marina bordering the entrance channel would be at 6 feet above LWD. Six boat launching ramps are planned for the southwest corner of the mooring area.

Discharge Method - The riprap and bedding stone would be installed using a land-based crane and a backhoe. The vertical walls would be constructed out of diaphragm cell steel pile capped with a concrete walkway and would be positioned as the newly-excavated mooring area wall with a crane and a backhoe and would then be filled with gravelly soil or concrete to hold it in place.

d. Wetland Construction: Introduction - As mitigation for wetlands which would be lost by locating a part of the boat harbor and entrance channel on a portion of the currently existing wetland area, a currently non-wetland acreage, greater than that which would be lost, is planned to be converted to a wetland.

Location and Bathymetry - The site which has been chosen for this wetlands creation is a fairly deep pond known as the west borrow pit, or Pond "A" which was created in 1969 when material was removed from this site to cover the marshland over which the parking lot was subsequently built. The west borrow pit was formerly an upland wooded area. It occupies approximately 5 acres with maximum water depths of 7.5 feet. There is a large knoll within approximately 1 foot of the surface in the northwest quadrant of the pit. Apparently, the combination of the steep slope and exposed clay subsoil has limited the rate of development of vegetation along the pit perimeter. A sparse band of cattail and sedges has colonized the lower section of the slope, and young willows and grasses occupy the upper part. Two species of wholly submersed aquatic plants, Sago Pondweed and Water-milfoil, sparsely occupy the shallower waters of the pond. Only one long shallow channel connects the west pit to the marsh which is located to the east of the pit. The channel runs northeast from a point just south of a finger-like peninsula on the east bank of the pit. The fill material required to create wetland conditions in the west borrow pit would be placed in it to an elevation varying from 0 feet to 8 feet above LWD, thus creating an extensive area with hydrologic characteristics which range from being exposed to air at low water levels to being submerged during high levels and including a central island which would always be exposed.

Discharge Method - The material would be trucked to a point due south of the borrow pit along the same route which was used to transport material from the pit. This is over an overgrown, unpaved roadway which is now a trail which borders the forested area adjacent to the parking lot. Material would be transported to the pit by either trucks or pans and would be graded with a bulldozer to design dimensions. The pond would be dewatered to facilitate

grading operations. The same technique would be used to enlarge the island in the east borrow pit (Pond "B").

e. Water Control Structure: Introduction - Changes in water level are essential to the maintenance of aquatic vegetation. The water level fluctuations in the marsh/swamp complex are the result of three interacting forces: (1) the flow rate of the creek which drains the marsh/swamp watershed into Lake Erie, (2) the water level of Lake Erie, and (3) the transport and deposition of littoral drift material in the creek mouth due to the wave energy of the lake. Even on occasions when the creek mouth is somewhat open, the water level in the marsh/swamp complex is higher than that of the lake because the sand beach which partly blocks the creek mouth functions as a low-head dam allowing only a small flow into the lake. With the proposed harbor entrance breakwaters in place, the wave energy at the creek mouth will be drastically reduced, and littoral drift will no longer be available to influence water levels in the marsh/swamp complex as radically as it does at present. Thus, without the proposed water level control structure, the project would result in a much less restricted flow of creek water into the lake with a general lowering of water level and conditions less favorable to maintenance of the wetland environment, which currently exists.

Location and Bathymetry - The proposed water control structure is essentially a small dam to be located at the creek mouth, which is roughly 6 feet wide at the place where water flows over the beach sand and gravel, and at a depth which varies from several inches to several feet. The control structure would consist of a 55-foot long concrete spillway, 8 feet wide with a pair of vertical slots formed by steel H-piles into which wooden planks (stoplogs) would fit. The planks, situated broadside to the direction of water flow, would obstruct water to the desired elevation. The regulation of water level, to within 8-inch increments, would be accomplished by varying the number of stoplogs in place. The water control structure also includes a steel sheet pile wall approximately 29 feet in length, situated broadside to the direction of water flow, to prevent water seepage through the water control structure.

Discharge Method - Construction of the spillway would be performed by pouring concrete onto the prepared site from a truck which would be driven onto the site over the upper portion of the beach. A piledriver would be used to drive the steel H-piles and the sheet steel into place.

f. Impermeable Boundary Layer Between Wetlands and Mooring Area: Introduction - The water level in the wetlands area would frequently be higher than that in the mooring area. The water levels in the wetlands would be intentionally maintained at between 3 and 6 feet above LWD while the mooring area water levels would be the same as lake levels. Consequently, in the absence of special construction features, water would frequently flow directly from the wetlands into the mooring area through the riprap sideslope of the west wall of the mooring area. To prevent this undesired water flow, the west wall of the mooring basin would need to be rendered impermeable. To accomplish this, a trench extending down to 2 feet below the underlying till layer would be dug and filled with glacial till obtained from excavation of

the mooring area. Till is unsorted or unstratified drift material, here composed of sand, gravel, cobbles and boulders in a clay matrix. Due to the presence of clay, the till is relatively impermeable.

Location and Bathymetry - The material would be placed along the west border of the proposed mooring area directly west of the area designated to be occupied by the riprap sideslope. It would occupy areas that are now occupied by a wooded old field, shallow marsh, deep marsh, and mowed grass. The trench would extend from the water control structure to the southwest corner of the marina, a distance of roughly 1,170 feet. It would very closely border or would cut through one or both of two deep wet areas, the east borrow pit (Pond "B") and a discrete section of shallow and deep marsh combined. The latter is a densely vegetated waist-deep pond-like area situated northeast of Pond "B" and separated from it by a 50-foot wide elevated ridge.

Discharge Method - Depending upon the water level and substrate stability at time of construction, material placement may require dewatering the discrete pond-like marsh area or construction could be performed during a time of low water and frozen ground. The trench would be excavated, and till material would be placed, using a back hoe and bulldozer.

2.2 Timing of Discharge. Construction is currently scheduled to begin in March of 1984 and would be completed by September the following year. Appropriate agencies with knowledge and authority regarding fish and wildlife movements in the area would be consulted to aid in scheduling activities so as to minimize impacts on fish spawning and migration.

2.3 Lifetime of Discharge Sites. Placement of entrance channel breakwaters, initial channel dredging, installation of mooring area periphery stabilization structures and the impermeable material in the west wall, wetland creation in the west borrow pit, island enlargement in the east borrow pit, and placement of the concrete and steel which would comprise the water control structure would all be one-time occurrences and uses of these discharge sites would thus occur only during construction of the project. Periodic maintenance dredging of the harbor entrance may be necessary at intervals of between 10 and 20 years. This Section 404 Evaluation is not intended to apply to such maintenance dredging because during the long time span between now and then the chemical and physical characteristics of the sediments may change. Independent testing and discharge site selection will therefore be required at such time that maintenance dredging is proposed.

3. Physical Effects.

3.1 Effects on Wetlands.

a. Entrance Channel Breakwaters - The pair of shore-connected breakwaters planned to be situated on the west and east sides of the harbor entrance channel would also flank the hydrologic connection between the marsh/swamp complex and Lake Erie. This configuration could potentially threaten the integrity of the wetlands by disrupting the coastal processes which affect littoral transport in the vicinity of the wetlands outlet.

(For this reason a water level control structure has been incorporated into the project plan.) A description of this process follows:

The Lake Erie shoreline in the vicinity of the State park is composed of unconsolidated material, primarily sand with some gravel and cobblestones. The prevailing winds, which are significant in influencing coastal processes, approach the shore from the northwest and the prevailing wave action is also from that direction. When waves reach the shallow region near shore, they break and energy is imparted onto the shore. The result of this energy transfer is a net movement of sediments along the shore in the direction opposite to that from which the waves approach the shore. Sediment is deposited, forming a beach across the wetlands outlet. The formation of this beach at the mouth of the drainage outlet of the marsh/swamp complex is a natural process which is vital to the wetlands ecosystem there. The beach is alternately built up and broken down as the variable opposing forces of alongshore sediment transport and lakeward water flow out of the wetlands interact. The existence of a beach serves to elevate the profile of the wetland creek outlet and reduce the flow of water through there, which results in frequent high water levels in the marsh/swamp complex. These variable, frequently high, water levels essential to the ecological integrity of the marsh/swamp complex are thus dependent ultimately upon wave-induced alongshore sediment transport processes.

With the proposed breakwaters in place, alongshore sand transport in the enclosed area would essentially cease because of a reduction in wave action and severance from the adjacent shoreline which is the source of beach material. Accordingly, a much narrower beach would exist at the mouth of the wetlands drainage outlet, and the wetland water level would not experience the extreme highs above the lake water level that it does under existing conditions. The wetland would soon decrease in size as vegetational succession toward terrestrial plant communities would occur in the absence of frequent high water levels. Findings of a recently completed survey of the biological resources of the study area, which included an examination of water levels, indicate that a frequently varied water level between roughly +3 and +6 LWD is a natural occurrence during high lake levels in the wetlands and is necessary for maintenance of the area as a wetland ecosystem. To maintain these water levels, and thus to prevent the occurrence of the above-stated potential negative effects of the harbor entrance breakwaters, a water control structure (see 3.1 e, below) is planned. An additional benefit of the water control structure is that a high water level can be maintained in the wetlands during periods of low lake level.

b. Entrance Channel Dredged Material - Placement of the sand component and the rock component of the entrance channel dredged material on the shoreline and at an upland site, respectively, would not affect wetlands.

c. Mooring Area Periphery Stabilization Structures - The riprap stone and diaphragm cell steel pile which would stabilize the sideslopes of the mooring area would have no effect on wetlands.

d. Wetland Construction - To compensate for the direct destruction of 2.2 acres of naturally occurring wetlands, a mitigation scheme which includes

the conversion of 5 acres into wetlands is proposed. The wetland creation area, known as Pond "A" or the west borrow pit, is a steep-sloped, fairly deep, man-made pond which is fairly sparsely vegetated. It is the proposed site for the discharge of 31,000 cubic yards of fill material for the purpose of raising the substrate elevation to a variable contour between 0 and 8 feet above LWD. This should result in the colonization of the site by wetland plant species because the soil in which the plants are to be rooted would be partly submerged and partly wet-emergent within the water level regime attainable through use of the proposed water control structure.

e. Water Control Structure - Because of the disruption of shoreline wave dynamics within the area bounded by the entrance channel breakwaters, a water control structure would be necessary to perform the function presently carried out by the beach which forms across the marsh/swamp complex drainage outlet, i.e. raising the profile of the outlet and impeding water flow so that there are frequent high water levels in the wetlands. The water control structure would be essentially a small dam which would facilitate control of the water level in the marsh/swamp watershed to within 8-inch increments (as experienced at the outlet) by means of removable stoplogs across a concrete spillway. The objective of the water control structure would be to maintain hydrologic conditions necessary for furtherance of the wetlands ecosystem. Periodic fluctuations should be induced because both high (submerged substrate and vegetation) and low (exposed substrate) water levels are desirable for fertile wetland maintenance. Some of the benefits of high water levels include provision of the habitat required for wetland plant species, fish and waterfowl, and the prevention of succession to a terrestrial habitat by excluding dry-site plant species. Occasional low water levels are useful in that they stimulate productivity by oxidizing undecomposed plant matter into useable form and allow for seed germination and also provide feeding habitat for shorebirds.

f. Impermeable Till Boundary Layer - The placement of till material to prevent seepage of water from the wetlands into the mooring area would at least require the initial destruction of .15 acre of wetlands which would be displaced to allow its placement. Additional deleterious wetland effects may occur during construction of the impermeable layer. The trench would probably transect the west margin of a fairly individually distinct wetland area of shallow and deep marsh which constitutes a waist-deep pond roughly 150 feet long and 100 feet wide occupied by many plant species including predominantly Cattail, Pickerel-weed, Spatterdock, Swamp Loosestrife, Water Smartweed, Bladderwort, and several species of Duckweed. Because the terrain is very wet and spongy, the placement of impermeable material here would require either that the pond be dewatered, or that construction equipment be operated during periods of low water and frozen ground. Either of these alternatives would be very destructive to this rather unique and diverse portion of the wetland, but would cause little overall comparative impact because the remaining majority of this plant community would subsequently be destroyed by the direct occupation of the site by the mooring area. After it is in position, the impermeable till layer would function to help maintain the water levels needed to perpetuate wetland environmental conditions.

3.2 Effects on the Water Column. Water column effects are those associated with a reduction in light transmission and aesthetic values and any predictable direct destruction effects on planktonic or nektonic populations.

a. Entrance Channel Breakwaters - Construction of the navigation structures will create slight amounts of turbidity, but as this activity will occur in the relatively unproductive lake littoral zone, physical effects on plankton and fish should be minimal.

b. Entrance Channel Dredged Material - The material which would be placed on the shore for the purpose of fortifying the bathing beach would slowly be distributed over a wide length of shore by wave action. This would not result in any more turbidity than would ordinarily exist in the area because the shoreline at the park, under existing conditions, is composed of unconsolidated material. Aesthetics may improve as a slightly wider sand beach in the vicinity of the east breakwater would result.

c. Mooring Area Periphery Stabilization Structures - Construction of the riprap and diaphragm cell pile sideslopes of the mooring area would occur within a dry, newly excavated cavity in the land, to be later filled with water when the entrance channel is opened. Therefore, there will be no water column effects by construction of this project component.

d. Wetland Construction - Placement of clean fill material into the borrow pits would change the physical environmental conditions there. This effect would be greater in the west borrow pit because of the greater amounts of fill proposed there, as opposed to the east pit where enlargement of an island to favor use by waterfowl is proposed. The west pit would be roughly three-fourths filled with material, with a resulting reduction in water level from a fairly uniform 7.5 feet to achieve a variable 7.5 to 0 foot depth, with a central island; intermediate depths would predominate.

The fish population in the marsh/swamp complex was inventoried in 1979 as part of the biological studies conducted by the U. S. Fish and Wildlife Service for the project study, wherein 13 species were found to inhabit the complex. The community was found to be typical of areas that are often more pond-like than free-flowing, and include Gizzard shad, Golden and Emerald Shiners, Bullhead, Carp, and five species in the sunfish family. Nearly all of the fish taken in the west borrow pit were sunfish, primarily Bluegill and Pumpkinseed, which were noted to be abundant. It was noted in the study that the low water levels experienced when the marsh mouth was open may place a major stress on the fish community and the borrow pits may provide refuge because the depth of the connecting channels limit the degree to which the pits can be drained. The placement of fill material for wetlands creation will limit the availability of a deepwater refuge for fish during low water; under the proposed plan there would be 2 acres of aquatic habitat with depths below the +3 feet above LWD contour (lowest water level attainable with use of proposed water control structure) compared with 5 acres under existing conditions in the west borrow pit.

Placement of fill material in the borrow pits would greatly increase turbidity there. The bottom sediments in these ponds is a very fine clay

material which, having been undisturbed for 11 years, has begun to become more stabilized due to the deposition of a thin fragile overlying mat of organic material composed primarily of loosely intertwined algal filaments. This overlying mat limits the resuspension of the clay substrate during mild disturbance. The operation of construction equipment in these ponds would disrupt the bottom, including this thin organic layer, and would result in long-term increases in turbidity. This effect may be more pronounced in the east pit than the west pit because the entire bottom of the west pit will be overlain with material which may have less of a tendency to become suspended than does the existing clay substrate.

The placement of fill material in the borrow pits would require that they be dewatered temporarily. Fish and any other wholly aquatic animals present would perish unless they were netted and transported to a watery milieu.

e. Water Control Structure - The placement of the water control structure would aesthetically degrade the water column by placing a 8-foot wide, 55-foot long barrier of concrete, steel, and wood in a channel which is wholly natural under existing conditions.

3.3 Effects on Benthos. Existing bottom-dwelling or attached organisms will be covered, and new habitat provided, in several of the plan components.

a. Entrance Channel Breakwaters - Construction of the navigation structures will result in the covering of about 2.7 acres of sandy lakeshore benthos habitat and resultant loss of benthos in these areas. The underwater surfaces of the rubblemound structures will provide significant new habitat for a different assemblage of benthos species. The total area of rubblemound structures, below LWD, available for colonization is about 1.6 acres, although considerably more habitat will be available in the interstices of the rubblemound structures. The existing population of macrobenthos along the open Lake Erie shoreline is rather low in numbers. Compared to what is lost by covering the sand and flat rock substrate, the habitat provided on the rubblemound structures should increase the diversity and population size of macrobenthos.

b. Entrance Channel Dredged Material - Dredged material placed onshore as beach nourishment material would disperse and cover existing benthos in a small area. Because the area affected would be very slight in comparison to the available area of similar habitat and there is sparse development of benthos in nearshore sites in exposed areas, the effect on benthic communities would be negligible.

c. Mooring Area Periphery Stabilization Structures - The riprap stone material of the west mooring area and the northeast wall bordering the entrance area would provide at least .22 acre of colonizable benthic habitat; the actual available area would be greater because of interstitial space present.

d. Wetland Construction - The substrate of the borrow pits is a very fine particle inorganic material with a thin overlying organic layer which supports populations of pulmonate snails (genera Physa and Lymnaea) and

insect larvae (orders Diptera and Odonata). All of the existing benthos would perish due to dewatering to facilitate placement of fill. This would be a temporary effect as reestablishment of benthic life forms would eventually take place. Ultimately, the diversity and density of benthic life in the west borrow pit may be greater under post-project conditions because the substrate would be more illuminated (hence more microscopic plant life to form part of a food chain base) and would be more organic (hence increased amounts of partly decayed plant and animal matter to support organisms with scavenger roles). Except for a slight reduction in available area, benthos in the east borrow pit would ultimately be little affected, but there would be a length of time, perhaps several years, during which increased turbidity levels and the unstabilized state of the bottom material may limit the extent of benthos development.

e. Water Control Structure - The water control structure would not have an effect on benthic communities.

f. Placement of impermeable fill would have little effect on benthic life forms other than the possible destruction through dewatering of the organisms in the individually distinct pond-like marsh which would be transected by the trench. Remaining wetland acres which would be transected are shallow, frequently exposed sites with sparse development of benthos.

3.4 Physical Changes. These changes, primarily in elevation, substrate, and aesthetics, are detailed above as an integral part of the descriptions of effects upon Wetlands, Water Column, and Benthos (3.1, 3.2, 3.3).

4. Biological-Chemical Interactive Effects.

4.1 Exclusion Criteria Determinations. The various approaches for testing the chemical-biological interactive effects of the discharge of dredged and fill materials are outlined in 40 CFR 230.4-1(b)(2) and (3). Dredged or fill materials may be excluded from further biological and chemical testing if any of the "exclusion criteria" as defined in 40 CFR 230.4-1(b)(1)(i), (ii), or (iii) are met. Briefly summarized, these exclusion criteria are: (i) that the dredged material is predominately sand, gravel, or any other naturally occurring sedimentary material with particle sizes larger than silt, usually found in high energy environments; (ii) that the material is suitable and being used for beach nourishment; and (iii) that the material proposed for discharge is primarily the same as at the proposed discharge site. The latter criterion also requires that the dredged material is sufficiently removed from sources of pollution to provide reasonable assurances that the material is not polluted from such sources, and that adequate disposal methods provide reasonable assurances that the discharged material will not be moved, by currents or otherwise, in a manner that is damaging to the environment outside the disposal area.

4.2 For the proposed Geneva-on-the-Lake project, the navigation structures, consisting of the harbor entrance channel breakwaters, the water control structure, and the mooring area stabilization structures will be constructed of heavy stone, steel, or cement. Such material is basically inert and meets the exclusion criteria defined in 40 CFR 230.4-1(b)(1)(i).

4.3 The dredged material from the harbor entrance channel would be sand and stone obtained from the nearshore high-energy environment. Thus, it meets the exclusion criteria defined in 40 CFR 230.4-1(b)(1)(i) and, if it is used for beach nourishment material, it also meets the criteria defined in 40 CFR 230.4-1(b)(1)(ii).

4.4 The material to be placed in the borrow pits to create wetland environmental conditions would be a variable-textured organic soil with many plant parts overlaying a more clayey bottom layer of material which would be placed first. Both of these substrates would be excavated from the future mooring area. They are different from the receiving area. The borrow pits have clayey, fine-particled, mineral soil bottoms. Therefore, this fill material does not meet any of the explicitly stated critera for exclusion from biological-chemical interactive testing in 40 CFR 230.4(b)(1)(i) through (iii). Because of the nature of the use of this material, to intentionally markedly alter the nature of the habitat of the receiving waters, and because it is not and never has been the site of the disposal or discharge of any known contaminants, there is no biological or chemical testing that would be appropriate to apply to the material. Therefore, contingent upon the approval of the Regional Administrator of the Environmental Protection Agency, it has been determined that no further chemical-biological testing of material to be discharged into waters of the United States will be performed in connection with the proposed project.

4.5 The impermeable till material to be placed above the existing till along the length of the west border to the mooring area is primarily the same as the existing till, and therefore it meets the exclusion criterion defined in 40 CFR 230.4-1(b)(1)(iii).

5. Site Comparisons.

5.1 As previously discussed, the physical and biological nature of the sites for placement of dredged or fill material would undergo changes, varying from slight to severe, depending upon the plan component.

6. Water Quality Considerations.

6.1 As the material to be used in constructing the navigation structures, mooring area sideslopes, the impermeable border, the water control structure, and the entrance channel dredged material meet the exclusion criteria, no further water quality testing of the material will be conducted. The excavated material planned to be used in constructing the island and wetlands will be confined to the borrow pits, and because its origin is a site free from known contaminants, it will not be subject to further testing.

7. Selection of Discharge Sites.

7.1 The criteria to be used in determining the selection of disposal sites for dredged and fill materials to be placed in the waters of the United

States are defined in 40 CFR 230.5. The various criteria and their relationships to the proposed project for Geneva-on-the-Lake are discussed in the following paragraphs.

7.2 Need for the Activity. The need for the construction of a small-boat harbor and harbor-of-refuge at Geneva-on-the-Lake, thereby creating a need for placement of fill material to facilitate navigation, stabilize the mooring area, and mitigate damages to the wetlands ecosystem, has been determined during the course of the Geneva-on-the-Lake study.

7.3 Alternative Sites. The Reformulation Phase I General Design Memorandum study, currently underway, has investigated a number of sites within Geneva State Park and the selected harbor configuration is the only arrangement which is feasible in view of the relevant planning objectives of the study, which are: (a) a cost-effective small-boat harbor, (b) minimal disruption of existing park facilities, and (c) minimal destruction of significant natural environment features. The discharge sites addressed herein are attributable to the specified harbor location.

7.4 Objectives in Discharge Determination. The general objectives in designating a discharge site for dredged or fill materials are defined in 40 CFR 230.5(a)(1) to (8). These objectives, summarized, state that discharge activities should avoid: (1) significant disruptions to the chemical, physical, and biological integrity of the aquatic ecosystem; (2) significant disruptions to the food chain; (3) significant disruptions to the movement of fauna into and out of breeding, feeding, and nursery areas; (4) destruction of wetlands; (5) disruption of areas that serve to contain floodwaters; (6) significant impacts on turbidity; (7) severely affecting aesthetic, recreational, and economic values; and (8) avoid degradation of water quality as specified in 40 CFR 230.4, and 40 CFR 230.5(c) and (d).

7.5 The results of the alternative harbor siting and associated discharge and disposal site studies being carried out in the Reformulation Phase I General Design Memorandum study, and reported in this preliminary Section 404 Evaluation for the study, have indicated that the proposed discharges of material meet many of the objectives discussed above. Some destructive effects, i.e. destruction of the existing sunfish fishery in the west borrow pit and the aesthetic affront of a water control structure to be placed in a site which is currently a shaded, naturally contoured, dynamic, nearshore creek mouth will occur. However, these are trade-offs which will be compensated for by a desirable recreational boating resource and the benefits of a wetlands ecosystem in place of the west borrow pit, the existence of which will in turn necessitate the water control structure at the outlet of the marsh/swamp complex.

7.6 Impacts on Water Uses. No discharge of materials associated with this project would take place in the proximity of municipal water intakes.

7.7 Impacts on Shellfish Beds. Not applicable.

7.8 Impacts on Fisheries. Guidance contained in 40 CFR 230.5(b)(3) states that significant disruptions of fish spawnings and nursery areas

should be avoided. To an extent, this would be accomplished through consultation with local authorities on fish resources to schedule activities in a way which minimizes these types of impacts. Inevitable disturbance of fish spawning and nursery areas will occur as the two borrow pits, the site of potentially significant sunfish populations, are dewatered to facilitate placements of material there. The west borrow pit will be altered from a pond environment to a marshy one with a deepwater periphery, with the consequent loss of a currently utilized warmwater fishery there. The nature of the fisheries will thus be changed to a more typically marsh-like one where, in addition to the sunfish (which are especially abundant in ponds but which are found sparsely in the marsh also) would include Grass Pickerel, Carp, and several species of Minnows. The breakwaters may provide spawning sites for Yellow Perch and White Sucker.

7.9 Impacts on Wildlife. No significant negative impacts on wildlife would occur from the proposed discharge activities. Ultimately, the wetlands which would be created on the west borrow pit and the island enlargement in the east pit are intended to enhance wildlife habitat.

7.10 Impacts on Recreation Activities. Existing recreation activities would be negligibly affected by the discharge of materials associated with the proposed project.

7.11 Impacts on Threatened and Endangered Species. There is no indication that the discharges would have effect on threatened or endangered species or their habitats as defined in the Endangered Species Act. Coordination with the U.S. Fish and Wildlife Service is being carried out to ensure that the proposed action would have no such effects.

7.12 Effects on Wetlands. The proposed discharges would result in the conversion of roughly 5 acres of open pond to vegetated wetlands to compensate for the destruction of 2.2 acres of existing wetlands for the mooring area. While the accuracy of a qualitative comparison of the wetland area which would be created versus that which would be destroyed is limited by inherent uncertainty of the exact nature of the wetlands which would be created, there is a fairly high probability that the species composition of the plant community inhabiting the created wetland would be similar to that of the existing wetlands. This is because the top layer of fill material in the borrow pits would be obtained from currently existing wetlands and would thus contain an abundance of viable seeds and bud-bearing plant parts of desirable wetland species. There is a potential, however, that the created wetlands may be comparatively short-lived because their location would be in a region of very calm water where sediment deposition and organic material accumulation would likely occur at a rapid rate, resulting in quick vegetational succession to a terrestrial plant community. To prevent this from occurring, the mitigation plan includes a provision to remove this sediment and organic material accumulation, as required.

7.13 Size of Discharge Sites. The size of the navigation structures covering approximately 2.7 acres is the minimum necessary to provide a safe entrance channel to the proposed boat harbor. The mooring area of slightly over 15 acres is the size which is required to provide a refuge space and

360 mooring spaces needed in the area. The wetlands area of roughly 5 acres which would be created is the amount needed to provide compensation for loss of other high quality wetlands. The size of the water control structure is determined by the rate of water flow in the marsh/swamp watershed which it would regulate.

7.14 Considerations to Minimize Harmful Effects. All appropriate considerations to minimize the harmful effects of the disposal of dredged or fill materials as defined in 40 CFR 230.5(c)(1-7) associated with the Geneva-on-the-Lake project have been considered in specifying the proposed disposal sites. These considerations, as summarized, include 40 CFR 230.5(c)(1) water quality criteria; (2) alternatives to open-water disposal; (3) physical characteristics of alternative disposal sites; (4) ocean dumping; (5) covering contaminated material with clean material; (6) minimize runoff from confined areas on the aquatic environment; and (7) coordination of potential monitoring activities with EPA.

8. Use of Materials from a Land Source and Mixing Zone Determinations.

8.1 Regulation 40 CFR 230.5(d) prohibits the discharge of fill materials from a land source when these materials are contaminated. The only land source material to be discharged in the Geneva-on-the-Lake project are rubblemound stone and mooring area excavated material which are believed to be free of anthropogenic contaminants.

8.2 Mixing zone determinations are not applicable in the case of the Geneva-on-the-Lake project as all discharges of dredged or fill materials would be of a confined nature or would be into receiving waters characterized by unconsolidated sediments and active water movement.

9. Conclusions and Determinations.

9.1 I have reviewed the documents pertinent to the construction of a small-boat harbor at Geneva-on-the-Lake, and have concluded that:

a. An ecological evaluation has been performed following the evaluation guidance contained in 40 CFR 230.4, in conjunction with the evaluation considerations in 40 CFR 230.5 (40 CFR 230.3(d)).

b. Appropriate measures have been identified and incorporated into the proposed plan to minimize adverse effects on the aquatic environment as a result of the discharge (40 CFR 230.3(d)(1)).

c. Consideration has been given to the need for the proposed activity, the availability of alternative sites and methods of disposal that are less damaging to the environment, and such water quality standards as are appropriate and applicable by law (40 CFR 230.5).

d. Some wetlands would be destroyed by construction of the project which would be compensated for by creation of a greater acreage of wetlands at the

currently non-wetland site. Secondary development of boating-related facilities in wetland areas would be controlled by the use of regulatory controls for the protection of wetlands.

10. Findings.

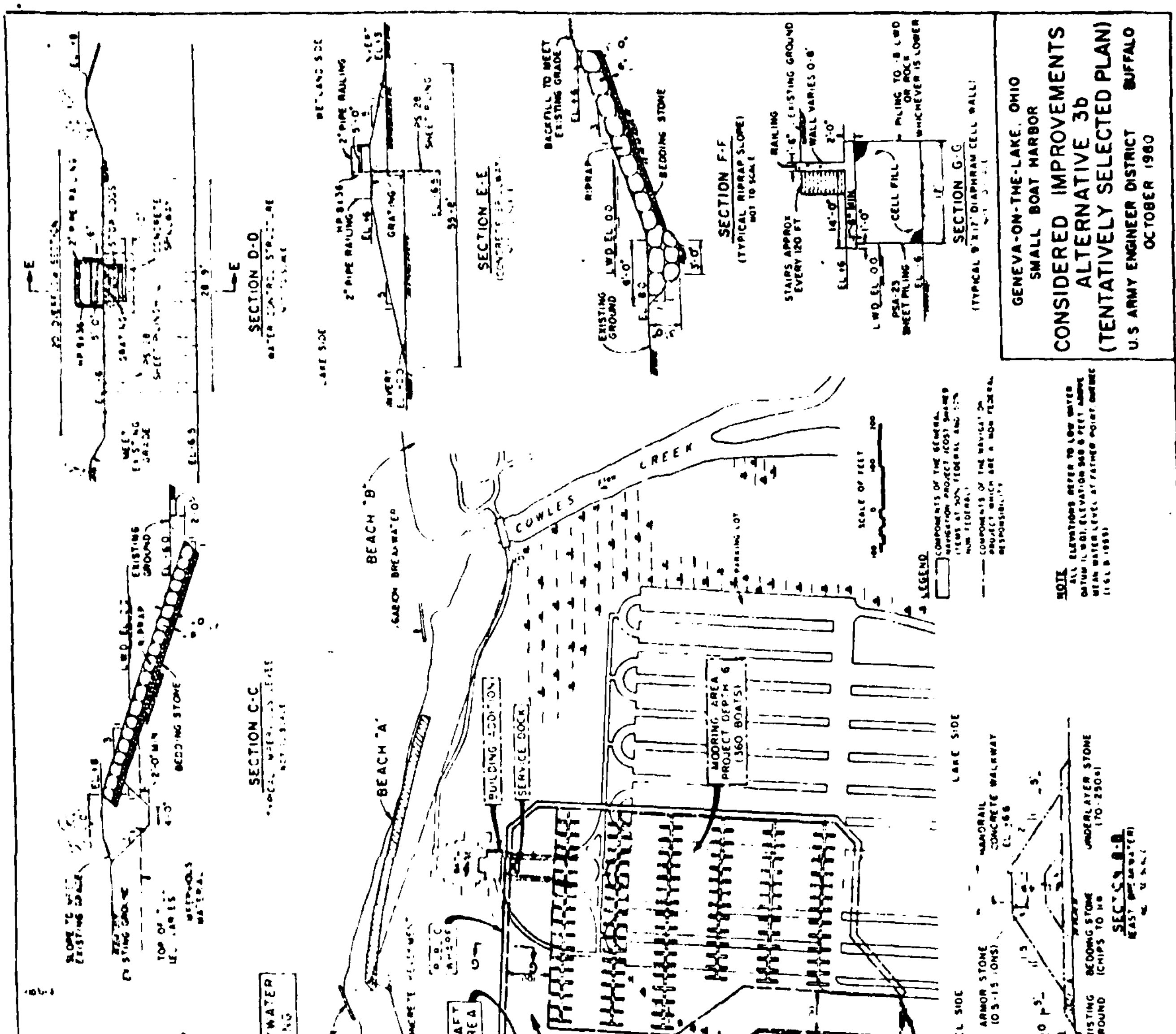
10.1 I find that the discharge of,

a.	Entrance Channel Breakwaters	-	16,000 tons of rubblemound armor stone 5,200 tons of bedding stone 2,400 tons of underlayer stone
b.	Entrance channel dredged material	-	4,000 cubic yards of sand and rock fragments.
c.	Mooring area periphery stabilization material	-	4,250 cubic yards (8,500 square yards) of riprap material 40,500 square feet of diaphragm cell steel pile in-place
d.	Wetland Construction	-	31,000 cubic yards of unpolluted excavated material
e.	Water control structure	-	30 cubic yards of concrete 332 square feet of sheet steel 500 cubic yards excavated for spillway
f.	Impermeable Boundary Layer Between Wetlands and Mooring Area	-	6,500 cubic yards of sand, gravel, and cobbles with a clay matrix

in Lake Erie, the proposed small-boat harbor, the existing wetlands and the existing excavated ponds at Geneva-on-the-Lake, OH, have been specified through application of Section 404(b)(1) of the Clean Water Act guidelines.

10/22/80
Date

GEORGE P. JOHNSON
Colonel, Corps of Engineers
District Engineer



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SECTION 404 EVALUATION
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1. Project Description.

1.1 The Tentatively Selected Plan. The Preferred Plan for the Geneva-on-the-Lake Small-Boat Harbor project is that alternative known as the Wetlands/Parking Lot Harbor Plan (Alternative 3b). This plan (illustrated on Plate 1) would provide a 360-slip all-weather harbor located within Geneva State Park, at the south shore of Lake Erie, on land which is partly a wetland area and partly parking and lawn areas. Environmental mitigation measures have been developed for implementation, and have been incorporated into the project plan. These measures would provide and maintain wetland conditions on an acreage greater than that which would be destroyed by construction of the boat harbor.

1.2 The small-boat harbor mooring area and harbor-of-refuge would occupy roughly 15.6 acres inland near the shore. It would be connected with Lake Erie via an entrance channel 100 feet wide and 400 feet long, which would be protected by a pair of rubblemound breakwaters extending into Lake Erie.

1.3 The plan would initially cause a considerable amount of irreversible wetlands destruction. The harbor is planned to be situated on an area which includes 2.2 acres of wet meadow, shallow marsh, and deep marsh combined. (There is a total of 6.6 acres of wet meadow and marsh in the immediate vicinity of the proposed project; this herbaceous wetland is part of a marsh/swamp complex of roughly 9.6 acres.) The completed harbor would be located contiguous to the remaining wetland area. Mitigation, through replacement in kind, by creating wetland conditions on an acreage greater than that of the wetlands lost by harbor construction is planned for the project. This includes: (1) placement of excavated material in an existing somewhat deep sparsely vegetated borrow pit to create a water level which will be conducive to the establishment of abundant wetland plant life; (2) enlargement, using excavated material, of an existing island in a second borrow pit, to favor the establishment of nesting waterfowl there; (3) construction of a water level control device and establishment of a program to regulate water levels in the entire marsh/swamp complex to maintain wetland environmental conditions, and (4) planting of a shrub barrier between the boat harbor and the wetlands to minimize disturbance reaching the wetlands. The result of these environmental mitigation measures will be that the area of wetlands in existence at Geneva State Park under post-project conditions will equal or exceed that which currently exists.

1.4 Section 404 Discharges. Legal requirements of Section 404 of the Clean Water Act (33 USC 1344), require the evaluation of the effects upon water quality of the disposal of dredged or fill materials into navigable

waters of the United States. This preliminary evaluation for the proposed Geneva-on-the-Lake Small-Boat Harbor project has been prepared using the general guidance contained in EC 1105-2-97, dated 8 May 1979, "Implementation of the Clean Water Act," and is being coordinated with the public in conformance with guidance contained in NCDPD-ER letter, dated 4 September 1979, "Public Coordination of Section 404(b)(1) Evaluations on Civil Works Projects." The first reference provides guidance on the content of Section 404(b)(1) Evaluations while the second reference states that a public notice, with attached preliminary Section 404 Evaluation, should be issued at the earliest possible time before completion of the Final Environmental Impact Statement.

1.5 The materials to be discharged into the waters of the United States for the proposed Geneva-on-the-Lake project include the following:

	Use and Location		Type and Quantity
a.	Entrance Channel Breakwaters extending into Lake Erie	-	16,000 tons of rubblemound armor stone 5,200 tons of bedding stone 2,400 tons of underlayer stone
b.	Entrance Channel Dredged Material to be placed upland and along shore	-	4,000 cubic yards of sand and rock fragments
c.	Mooring Area Periphery Stabilization Material	-	4,250 cubic yards (8,500 square yards) of riprap material 40,500 square feet of diaphragm cell steel pile in place
d.	Wetland Construction in borrow pits (Ponds "A" and "B")	-	31,000 cubic yards of unpolluted excavated material
e.	Water Control Structure at mouth of marsh creek	-	30 cubic yards of concrete 332 square feet of sheet steel 500 cubic yards excavated for spillway
f.	Impermeable Boundary Layer between wetlands and mooring area	-	6,500 cubic yards of sand, gravel, and cobbles in a clay matrix

1.6 Source of Materials. The rubblemound stone, riprap stone, and bedding stone to be used in constructing the breakwaters and in stabilizing the periphery of the mooring area would be obtained from a commercial quarry. The actual location of the quarry would be determined at the time of construction of the project. The source of construction materials for the water control structure and the steel used for the mooring area walls would be determined by the Contractor in conformance with Government specifications for the materials. The material to be used in wetlands creation would be obtained from the portion of the future mooring area which is currently

occupied by marsh or wet meadow. The impermeable fill material at the wetlands-mooring area border, would be excavated material from the site of the future mooring area. Fill material for grading the slopes surrounding the water control structure will be obtained from material excavated for the spillway.

2. The Discharge and Discharge Sites.

2.1 Location, Bathymetry and Methods of Discharge. The discharges into waters of the United States include the materials listed as (a) through (f) in paragraph 1.5 above. For specific locations of each of these discharges, refer to Plate 1 and the following which includes a description of the site bathymetry, the discharge methods, and also includes introductory information where appropriate.

a. Entrance Channel Breakwaters: Location and Bathymetry - These are planned to be a pair of shore-connected structures extending into Lake Erie in arrowhead fashion, with the distance between them to be 150 feet at the lakeward ends, and 800 feet at the shoreward ends. They would flank both the proposed entrance channel to the harbor and the portion of the shore which includes the hydrologic connection between the marsh/swamp complex and Lake Erie (the marsh creek). They would be constructed across the shallow littoral zone of Lake Erie extending from the shore to a depth of 8 feet below Low Water Datum (LWD), which for Lake Erie is elevation 568.6 feet above mean water level at Father Point, Quebec, International Great Lakes Datum (IGLD 1955). The existing substrates here are predominantly sand and shale fragments with small amounts of silt.

Discharge Method - The stone used for construction of the navigation structures would be brought to the area on barges and be placed by water-based cranes into the waters of Lake Erie.

b. Entrance Channel Dredged Material: Location and Bathymetry - This material would consist of two components: sand and rock fragments. The former is the unconsolidated bottom material in the nearshore region which thinly overlies bedrock. The latter is the bedrock which would need to be loosened and removed during excavation of an entrance channel with a bottom depth of 8 feet below LWD. The sand would be placed on the shore in the lee of the east breakwater, to aid in beach building.

Discharge Method - The rock would be placed at an upland site within the park. Dredging and sand placement would be accomplished with a water-based clamshell dredge. Bedrock would be loosened with explosives.

c. Mooring Area Periphery Stabilization Structures: Location and Bathymetry - Current plans call for the west side of the mooring area and the northeast wall of the marina bordering the entrance channel to be of riprap stone material, with a 1 on 3 slope, and the north, south, and east sides of the mooring basin to be vertical walls of diaphragm cell steel pile construction. This combination and configuration of materials is tentative, depending upon the results of wave-action model tests currently being performed by the Corps Waterways Experiment Station. The objective of these

tests is to ensure a harbor design with an acceptably low amount of internal wave action, which is related to the wave absorbing and reflecting properties of the sides of the mooring basin. Riprapped side slopes would have a pitch of one vertical unit for each three horizontal units (a 1 on 3 slope). The riprap stone slope would have the toe end in a depth of 8 feet below LWD along the entrance channel and mooring (refuge) area and 6 feet below LWD along the inner channels. The crest of the west wall would be at an elevation of 8 feet above LWD and the crest of the northeast wall of the marina bordering the entrance channel would be at 6 feet above LWD. Six boat launching ramps are planned for the southwest corner of the mooring area.

Discharge Method - The riprap and bedding stone would be installed using a land-based crane and a backhoe. The vertical walls would be constructed out of diaphragm cell steel pile capped with a concrete walkway and would be positioned as the newly-excavated mooring area wall with a crane and a backhoe and would then be filled with gravelly soil or concrete to hold it in place.

d. Wetland Construction: Introduction - As mitigation for wetlands which would be lost by locating a part of the boat harbor and entrance channel on a portion of the currently existing wetland area, a currently non-wetland acreage, greater than that which would be lost, is planned to be converted to a wetland.

Location and Bathymetry - The site which has been chosen for this wetlands creation is a fairly deep pond known as the west borrow pit, or Pond "A" which was created in 1969 when material was removed from this site to cover the marshland over which the parking lot was subsequently built. The west borrow pit was formerly an upland wooded area. It occupies approximately 5 acres with maximum water depths of 7.5 feet. There is a large knoll within approximately 1 foot of the surface in the northwest quadrant of the pit. Apparently, the combination of the steep slope and exposed clay subsoil has limited the rate of development of vegetation along the pit perimeter. A sparse band of cattail and sedges has colonized the lower section of the slope, and young willows and grasses occupy the upper part. Two species of wholly submersed aquatic plants, Sago Pondweed and Water-milfoil, sparsely occupy the shallower waters of the pond. Only one long shallow channel connects the west pit to the marsh which is located to the east of the pit. The channel runs northeast from a point just south of a finger-like peninsula on the east bank of the pit. The fill material required to create wetland conditions in the west borrow pit would be placed in it to an elevation varying from 0 feet to 8 feet above LWD, thus creating an extensive area with hydrologic characteristics which range from being exposed to air at low water levels to being submerged during high levels and including a central island which would always be exposed.

Discharge Method - The material would be trucked to a point due south of the borrow pit along the same route which was used to transport material from the pit. This is over an overgrown, unpaved roadway which is now a trail which borders the forested area adjacent to the parking lot. Material would be transported to the pit by either trucks or pans and would be graded with a bulldozer to design dimensions. The pond would be dewatered to facilitate

grading operations. The same technique would be used to enlarge the island in the east borrow pit (Pond "B").

e. Water Control Structure: Introduction - Changes in water level are essential to the maintenance of aquatic vegetation. The water level fluctuations in the marsh/swamp complex are the result of three interacting forces: (1) the flow rate of the creek which drains the marsh/swamp watershed into Lake Erie, (2) the water level of Lake Erie, and (3) the transport and deposition of littoral drift material in the creek mouth due to the wave energy of the lake. Even on occasions when the creek mouth is somewhat open, the water level in the marsh/swamp complex is higher than that of the lake because the sand beach which partly blocks the creek mouth functions as a low-head dam allowing only a small flow into the lake. With the proposed harbor entrance breakwaters in place, the wave energy at the creek mouth will be drastically reduced, and littoral drift will no longer be available to influence water levels in the marsh/swamp complex as radically as it does at present. Thus, without the proposed water level control structure, the project would result in a much less restricted flow of creek water into the lake with a general lowering of water level and conditions less favorable to maintenance of the wetland environment, which currently exists.

Location and Bathymetry - The proposed water control structure is essentially a small dam to be located at the creek mouth, which is roughly 6 feet wide at the place where water flows over the beach sand and gravel, and at a depth which varies from several inches to several feet. The control structure would consist of a 55-foot long concrete spillway, 8 feet wide with a pair of vertical slots formed by steel H-piles into which wooden planks (stoplogs) would fit. The planks, situated broadside to the direction of water flow, would obstruct water to the desired elevation. The regulation of water level, to within 8-inch increments, would be accomplished by varying the number of stoplogs in place. The water control structure also includes a steel sheet pile wall approximately 29 feet in length, situated broadside to the direction of water flow, to prevent water seepage through the water control structure.

Discharge Method - Construction of the spillway would be performed by pouring concrete onto the prepared site from a truck which would be driven onto the site over the upper portion of the beach. A piledriver would be used to drive the steel H-piles and the sheet steel into place.

f. Impermeable Boundary Layer Between Wetlands and Mooring Area: Introduction - The water level in the wetlands area would frequently be higher than that in the mooring area. The water levels in the wetlands would be intentionally maintained at between 3 and 6 feet above LWD while the mooring area water levels would be the same as lake levels. Consequently, in the absence of special construction features, water would frequently flow directly from the wetlands into the mooring area through the riprap sideslope of the west wall of the mooring area. To prevent this undesired water flow, the west wall of the mooring basin would need to be rendered impermeable. To accomplish this, a trench extending down to 2 feet below the underlying till layer would be dug and filled with glacial till obtained from excavation of

the mooring area. Till is unsorted or unstratified drift material, here composed of sand, gravel, cobbles and boulders in a clay matrix. Due to the presence of clay, the till is relatively impermeable.

Location and Bathymetry - The material would be placed along the west border of the proposed mooring area directly west of the area designated to be occupied by the riprap sideslope. It would occupy areas that are now occupied by a wooded old field, shallow marsh, deep marsh, and mowed grass. The trench would extend from the water control structure to the southwest corner of the marina, a distance of roughly 1,170 feet. It would very closely border or would cut through one or both of two deep wet areas, the east borrow pit (Pond "B") and a discrete section of shallow and deep marsh combined. The latter is a densely vegetated waist-deep pond-like area situated northeast of Pond "B" and separated from it by a 50-foot wide elevated ridge.

Discharge Method - Depending upon the water level and substrate stability at time of construction, material placement may require dewatering the discrete pond-like marsh area or construction could be performed during a time of low water and frozen ground. The trench would be excavated, and till material would be placed, using a back hoe and bulldozer.

2.2 Timing of Discharge. Construction is currently scheduled to begin in March of 1984 and would be completed by September the following year. Appropriate agencies with knowledge and authority regarding fish and wildlife movements in the area would be consulted to aid in scheduling activities so as to minimize impacts on fish spawning and migration.

2.3 Lifetime of Discharge Sites. Placement of entrance channel breakwaters, initial channel dredging, installation of mooring area periphery stabilization structures and the impermeable material in the west wall, wetland creation in the west borrow pit, island enlargement in the east borrow pit, and placement of the concrete and steel which would comprise the water control structure would all be one-time occurrences and uses of these discharge sites would thus occur only during construction of the project. Periodic maintenance dredging of the harbor entrance may be necessary at intervals of between 10 and 20 years. This Section 404 Evaluation is not intended to apply to such maintenance dredging because during the long time span between now and then the chemical and physical characteristics of the sediments may change. Independent testing and discharge site selection will therefore be required at such time that maintenance dredging is proposed.

3. Physical Effects.

3.1 Effects on Wetlands.

a. Entrance Channel Breakwaters - The pair of shore-connected breakwaters planned to be situated on the west and east sides of the harbor entrance channel would also flank the hydrologic connection between the marsh/swamp complex and Lake Erie. This configuration could potentially threaten the integrity of the wetlands by disrupting the coastal processes which affect littoral transport in the vicinity of the wetlands outlet.

(For this reason a water level control structure has been incorporated into the project plan.) A description of this process follows:

The Lake Erie shoreline in the vicinity of the State park is composed of unconsolidated material, primarily sand with some gravel and cobblestones. The prevailing winds, which are significant in influencing coastal processes, approach the shore from the northwest and the prevailing wave action is also from that direction. When waves reach the shallow region near shore, they break and energy is imparted onto the shore. The result of this energy transfer is a net movement of sediments along the shore in the direction opposite to that from which the waves approach the shore. Sediment is deposited, forming a beach across the wetlands outlet. The formation of this beach at the mouth of the drainage outlet of the marsh/swamp complex is a natural process which is vital to the wetlands ecosystem there. The beach is alternately built up and broken down as the variable opposing forces of alongshore sediment transport and lakeward water flow out of the wetlands interact. The existence of a beach serves to elevate the profile of the wetland creek outlet and reduce the flow of water through there, which results in frequent high water levels in the marsh/swamp complex. These variable, frequently high, water levels essential to the ecological integrity of the marsh/swamp complex are thus dependent ultimately upon wave-induced alongshore sediment transport processes.

With the proposed breakwaters in place, alongshore sand transport in the enclosed area would essentially cease because of a reduction in wave action and severance from the adjacent shoreline which is the source of beach material. Accordingly, a much narrower beach would exist at the mouth of the wetlands drainage outlet, and the wetland water level would not experience the extreme highs above the lake water level that it does under existing conditions. The wetland would soon decrease in size as vegetational succession toward terrestrial plant communities would occur in the absence of frequent high water levels. Findings of a recently completed survey of the biological resources of the study area, which included an examination of water levels, indicate that a frequently varied water level between roughly +3 and +6 LWD is a natural occurrence during high lake levels in the wetlands and is necessary for maintenance of the area as a wetland ecosystem. To maintain these water levels, and thus to prevent the occurrence of the above-stated potential negative effects of the harbor entrance breakwaters, a water control structure (see 3.1 e, below) is planned. An additional benefit of the water control structure is that a high water level can be maintained in the wetlands during periods of low lake level.

b. Entrance Channel Dredged Material - Placement of the sand component and the rock component of the entrance channel dredged material on the shoreline and at an upland site, respectively, would not affect wetlands.

c. Mooring Area Periphery Stabilization Structures - The riprap stone and diaphragm cell steel pile which would stabilize the sideslopes of the mooring area would have no effect on wetlands.

d. Wetland Construction - To compensate for the direct destruction of 2.2 acres of naturally occurring wetlands, a mitigation scheme which includes

the conversion of 5 acres into wetlands is proposed. The wetland creation area, known as Pond "A" or the west borrow pit, is a steep-sloped, fairly deep, man-made pond which is fairly sparsely vegetated. It is the proposed site for the discharge of 31,000 cubic yards of fill material for the purpose of raising the substrate elevation to a variable contour between 0 and 8 feet above LWD. This should result in the colonization of the site by wetland plant species because the soil in which the plants are to be rooted would be partly submerged and partly wet-emergent within the water level regime attainable through use of the proposed water control structure.

e. Water Control Structure - Because of the disruption of shoreline wave dynamics within the area bounded by the entrance channel breakwaters, a water control structure would be necessary to perform the function presently carried out by the beach which forms across the marsh/swamp complex drainage outlet, i.e. raising the profile of the outlet and impeding water flow so that there are frequent high water levels in the wetlands. The water control structure would be essentially a small dam which would facilitate control of the water level in the marsh/swamp watershed to within 8-inch increments (as experienced at the outlet) by means of removable stoplogs across a concrete spillway. The objective of the water control structure would be to maintain hydrologic conditions necessary for furtherance of the wetlands ecosystem. Periodic fluctuations should be induced because both high (submerged substrate and vegetation) and low (exposed substrate) water levels are desirable for fertile wetland maintenance. Some of the benefits of high water levels include provision of the habitat required for wetland plant species, fish and waterfowl, and the prevention of succession to a terrestrial habitat by excluding dry-site plant species. Occasional low water levels are useful in that they stimulate productivity by oxidizing undecomposed plant matter into useable form and allow for seed germination and also provide feeding habitat for shorebirds.

f. Impermeable Till Boundary Layer - The placement of till material to prevent seepage of water from the wetlands into the mooring area would at least require the initial destruction of .15 acre of wetlands which would be displaced to allow its placement. Additional deleterious wetland effects may occur during construction of the impermeable layer. The trench would probably transect the west margin of a fairly individually distinct wetland area of shallow and deep marsh which constitutes a waist-deep pond roughly 150 feet long and 100 feet wide occupied by many plant species including predominantly Cattail, Pickerel-weed, Spatterdock, Swamp Loosestrife, Water Smartweed, Bladderwort, and several species of Duckweed. Because the terrain is very wet and spongy, the placement of impermeable material here would require either that the pond be dewatered, or that construction equipment be operated during periods of low water and frozen ground. Either of these alternatives would be very destructive to this rather unique and diverse portion of the wetland, but would cause little overall comparative impact because the remaining majority of this plant community would subsequently be destroyed by the direct occupation of the site by the mooring area. After it is in position, the impermeable till layer would function to help maintain the water levels needed to perpetuate wetland environmental conditions.

3.2 Effects on the Water Column. Water column effects are those associated with a reduction in light transmission and aesthetic values and any predictable direct destruction effects on planktonic or nektonic populations.

a. Entrance Channel Breakwaters - Construction of the navigation structures will create slight amounts of turbidity, but as this activity will occur in the relatively unproductive lake littoral zone, physical effects on plankton and fish should be minimal.

b. Entrance Channel Dredged Material - The material which would be placed on the shore for the purpose of fortifying the bathing beach would slowly be distributed over a wide length of shore by wave action. This would not result in any more turbidity than would ordinarily exist in the area because the shoreline at the park, under existing conditions, is composed of unconsolidated material. Aesthetics may improve as a slightly wider sand beach in the vicinity of the east breakwater would result.

c. Mooring Area Periphery Stabilization Structures - Construction of the riprap and diaphragm cell pile sideslopes of the mooring area would occur within a dry, newly excavated cavity in the land, to be later filled with water when the entrance channel is opened. Therefore, there will be no water column effects by construction of this project component.

d. Wetland Construction - Placement of clean fill material into the borrow pits would change the physical environmental conditions there. This effect would be greater in the west borrow pit because of the greater amounts of fill proposed there, as opposed to the east pit where enlargement of an island to favor use by waterfowl is proposed. The west pit would be roughly three-fourths filled with material, with a resulting reduction in water level from a fairly uniform 7.5 feet to achieve a variable 7.5 to 0 foot depth, with a central island; intermediate depths would predominate.

The fish population in the marsh/swamp complex was inventoried in 1979 as part of the biological studies conducted by the U. S. Fish and Wildlife Service for the project study, wherein 13 species were found to inhabit the complex. The community was found to be typical of areas that are often more pond-like than free-flowing, and include Gizzard shad, Golden and Emerald Shiners, Bullhead, Carp, and five species in the sunfish family. Nearly all of the fish taken in the west borrow pit were sunfish, primarily Bluegill and Pumpkinseed, which were noted to be abundant. It was noted in the study that the low water levels experienced when the marsh mouth was open may place a major stress on the fish community and the borrow pits may provide refuge because the depth of the connecting channels limit the degree to which the pits can be drained. The placement of fill material for wetlands creation will limit the availability of a deepwater refuge for fish during low water; under the proposed plan there would be 2 acres of aquatic habitat with depths below the +3 feet above LWD contour (lowest water level attainable with use of proposed water control structure) compared with 5 acres under existing conditions in the west borrow pit.

Placement of fill material in the borrow pits would greatly increase turbidity there. The bottom sediments in these ponds is a very fine clay

material which, having been undisturbed for 11 years, has begun to become more stabilized due to the deposition of a thin fragile overlying mat of organic material composed primarily of loosely intertwined algal filaments. This overlying mat limits the resuspension of the clay substrate during mild disturbance. The operation of construction equipment in these ponds would disrupt the bottom, including this thin organic layer, and would result in long-term increases in turbidity. This effect may be more pronounced in the east pit than the west pit because the entire bottom of the west pit will be overlain with material which may have less of a tendency to become suspended than does the existing clay substrate.

The placement of fill material in the borrow pits would require that they be dewatered temporarily. Fish and any other wholly aquatic animals present would perish unless they were netted and transported to a watery milieu.

e. Water Control Structure - The placement of the water control structure would aesthetically degrade the water column by placing a 8-foot wide, 55-foot long barrier of concrete, steel, and wood in a channel which is wholly natural under existing conditions.

3.3 Effects on Benthos. Existing bottom-dwelling or attached organisms will be covered, and new habitat provided, in several of the plan components.

a. Entrance Channel Breakwaters - Construction of the navigation structures will result in the covering of about 2.7 acres of sandy lakeshore benthos habitat and resultant loss of benthos in these areas. The underwater surfaces of the rubblemound structures will provide significant new habitat for a different assemblage of benthos species. The total area of rubblemound structures, below LWD, available for colonization is about 1.6 acres, although considerably more habitat will be available in the interstices of the rubblemound structures. The existing population of macrobenthos along the open Lake Erie shoreline is rather low in numbers. Compared to what is lost by covering the sand and flat rock substrate, the habitat provided on the rubblemound structures should increase the diversity and population size of macrobenthos.

b. Entrance Channel Dredged Material - Dredged material placed onshore as beach nourishment material would disperse and cover existing benthos in a small area. Because the area affected would be very slight in comparison to the available area of similar habitat and there is sparse development of benthos in nearshore sites in exposed areas, the effect on benthic communities would be negligible.

c. Mooring Area Periphery Stabilization Structures - The riprap stone material of the west mooring area and the northeast wall bordering the entrance area would provide at least .22 acre of colonizable benthic habitat; the actual available area would be greater because of intersticial space present.

d. Wetland Construction - The substrate of the borrow pits is a very fine particle inorganic material with a thin overlying organic layer which supports populations of pulmonate snails (genera Physa and Lymnaea) and

insect larvae (orders Diptera and Odonata). All of the existing benthos would perish due to dewatering to facilitate placement of fill. This would be a temporary effect as reestablishment of benthic life forms would eventually take place. Ultimately, the diversity and density of benthic life in the west borrow pit may be greater under post-project conditions because the substrate would be more illuminated (hence more microscopic plant life to form part of a food chain base) and would be more organic (hence increased amounts of partly decayed plant and animal matter to support organisms with scavenger roles). Except for a slight reduction in available area, benthos in the east borrow pit would ultimately be little affected, but there would be a length of time, perhaps several years, during which increased turbidity levels and the unstabilized state of the bottom material may limit the extent of benthos development.

e. Water Control Structure - The water control structure would not have an effect on benthic communities.

f. Placement of impermeable fill would have little effect on benthic life forms other than the possible destruction through dewatering of the organisms in the individually distinct pond-like marsh which would be transected by the trench. Remaining wetland acres which would be transected are shallow, frequently exposed sites with sparse development of benthos.

3.4 Physical Changes. These changes, primarily in elevation, substrate, and aesthetics, are detailed above as an integral part of the descriptions of effects upon Wetlands, Water Column, and Benthos (3.1, 3.2, 3.3).

4. Biological-Chemical Interactive Effects.

4.1 Exclusion Criteria Determinations. The various approaches for testing the chemical-biological interactive effects of the discharge of dredged and fill materials are outlined in 40 CFR 230.4-1(b)(2) and (3). Dredged or fill materials may be excluded from further biological and chemical testing if any of the "exclusion criteria" as defined in 40 CFR 230.4-1(b)(1)(i), (ii), or (iii) are met. Briefly summarized, these exclusion criteria are: (i) that the dredged material is predominately sand, gravel, or any other naturally occurring sedimentary material with particle sizes larger than silt, usually found in high energy environments; (ii) that the material is suitable and being used for beach nourishment; and (iii) that the material proposed for discharge is primarily the same as at the proposed discharge site. The latter criterion also requires that the dredged material is sufficiently removed from sources of pollution to provide reasonable assurances that the material is not polluted from such sources, and that adequate disposal methods provide reasonable assurances that the discharged material will not be moved, by currents or otherwise, in a manner that is damaging to the environment outside the disposal area.

4.2 For the proposed Geneva-on-the-Lake project, the navigation structures, consisting of the harbor entrance channel breakwaters, the water control structure, and the mooring area stabilization structures will be constructed of heavy stone, steel, or cement. Such material is basically inert and meets the exclusion criteria defined in 40 CFR 230.4-1(b)(1)(i).

4.3 The dredged material from the harbor entrance channel would be sand and stone obtained from the nearshore high-energy environment. Thus, it meets the exclusion criteria defined in 40 CFR 230.4-1(b)(1)(i) and, if it is used for beach nourishment material, it also meets the criteria defined in 40 CFR 230.4-1(b)(1)(ii).

4.4 The material to be placed in the borrow pits to create wetland environmental conditions would be a variable-textured organic soil with many plant parts overlaying a more clayey bottom layer of material which would be placed first. Both of these substrates would be excavated from the future mooring area. They are different from the receiving area. The borrow pits have clayey, fine-particled, mineral soil bottoms. Therefore, this fill material does not meet any of the explicitly stated critera for exclusion from biological-chemical interactive testing in 40 CFR 230.4(b)(1)(i) through (iii). Because of the nature of the use of this material, to intentionally markedly alter the nature of the habitat of the receiving waters, and because it is not and never has been the site of the disposal or discharge of any known contaminants, there is no biological or chemical testing that would be appropriate to apply to the material. Therefore, contingent upon the approval of the Regional Administrator of the Environmental Protection Agency, it has been determined that no further chemical-biological testing of material to be discharged into waters of the United States will be performed in connection with the proposed project.

4.5 The impermeable till material to be placed above the existing till along the length of the west border to the mooring area is primarily the same as the existing till, and therefore it meets the exclusion criterion defined in 40 CFR 230.4-1(b)(1)(iii).

5. Site Comparisons.

5.1 As previously discussed, the physical and biological nature of the sites for placement of dredged or fill material would undergo changes, varying from slight to severe, depending upon the plan component.

6. Water Quality Considerations.

6.1 As the material to be used in constructing the navigation structures, mooring area sideslopes, the impermeable border, the water control structure, and the entrance channel dredged material meet the exclusion criteria, no further water quality testing of the material will be conducted. The excavated material planned to be used in constructing the island and wetlands will be confined to the borrow pits, and because its origin is a site free from known contaminants, it will not be subject to further testing.

7. Selection of Discharge Sites.

7.1 The criteria to be used in determining the selection of disposal sites for dredged and fill materials to be placed in the waters of the United

States are defined in 40 CFR 230.5. The various criteria and their relationships to the proposed project for Geneva-on-the-Lake are discussed in the following paragraphs.

7.2 Need for the Activity. The need for the construction of a small-boat harbor and harbor-of-refuge at Geneva-on-the-Lake, thereby creating a need for placement of fill material to facilitate navigation, stabilize the mooring area, and mitigate damages to the wetlands ecosystem, has been determined during the course of the Geneva-on-the-Lake study.

7.3 Alternative Sites. The Reformulation Phase I General Design Memorandum study, currently underway, has investigated a number of sites within Geneva State Park and the selected harbor configuration is the only arrangement which is feasible in view of the relevant planning objectives of the study, which are: (a) a cost-effective small-boat harbor, (b) minimal disruption of existing park facilities, and (c) minimal destruction of significant natural environment features. The discharge sites addressed herein are attributable to the specified harbor location.

7.4 Objectives in Discharge Determination. The general objectives in designating a discharge site for dredged or fill materials are defined in 40 CFR 230.5(a)(1) to (8). These objectives, summarized, state that discharge activities should avoid: (1) significant disruptions to the chemical, physical, and biological integrity of the aquatic ecosystem; (2) significant disruptions to the food chain; (3) significant disruptions to the movement of fauna into and out of breeding, feeding, and nursery areas; (4) destruction of wetlands; (5) disruption of areas that serve to contain floodwaters; (6) significant impacts on turbidity; (7) severely affecting aesthetic, recreational, and economic values; and (8) avoid degradation of water quality as specified in 40 CFR 230.4, and 40 CFR 230.5(c) and (d).

7.5 The results of the alternative harbor siting and associated discharge and disposal site studies being carried out in the Reformulation Phase I General Design Memorandum study, and reported in this preliminary Section 404 Evaluation for the study, have indicated that the proposed discharges of material meet many of the objectives discussed above. Some destructive effects, i.e. destruction of the existing sunfish fishery in the west borrow pit and the aesthetic affront of a water control structure to be placed in a site which is currently a shaded, naturally contoured, dynamic, nearshore creek mouth will occur. However, these are trade-offs which will be compensated for by a desirable recreational boating resource and the benefits of a wetlands ecosystem in place of the west borrow pit, the existence of which will in turn necessitate the water control structure at the outlet of the marsh/swamp complex.

7.6 Impacts on Water Uses. No discharge of materials associated with this project would take place in the proximity of municipal water intakes.

7.7 Impacts on Shellfish Beds. Not applicable.

7.8 Impacts on Fisheries. Guidance contained in 40 CFR 230.5(b)(3) states that significant disruptions of fish spawnings and nursery areas

should be avoided. To an extent, this would be accomplished through consultation with local authorities on fish resources to schedule activities in a way which minimizes these types of impacts. Inevitable disturbance of fish spawning and nursery areas will occur as the two borrow pits, the site of potentially significant sunfish populations, are dewatered to facilitate placements of material there. The west borrow pit will be altered from a pond environment to a marshy one with a deepwater periphery, with the consequent loss of a currently utilized warmwater fishery there. The nature of the fisheries will thus be changed to a more typically marsh-like one where, in addition to the sunfish (which are especially abundant in ponds but which are found sparsely in the marsh also) would include Grass Pickerel, Carp, and several species of Minnows. The breakwaters may provide spawning sites for Yellow Perch and White Sucker.

7.9 Impacts on Wildlife. No significant negative impacts on wildlife would occur from the proposed discharge activities. Ultimately, the wetlands which would be created on the west borrow pit and the island enlargement in the east pit are intended to enhance wildlife habitat.

7.10 Impacts on Recreation Activities. Existing recreation activities would be negligibly affected by the discharge of materials associated with the proposed project.

7.11 Impacts on Threatened and Endangered Species. There is no indication that the discharges would have effect on threatened or endangered species or their habitats as defined in the Endangered Species Act. Coordination with the U.S. Fish and Wildlife Service is being carried out to ensure that the proposed action would have no such effects.

7.12 Effects on Wetlands. The proposed discharges would result in the conversion of roughly 5 acres of open pond to vegetated wetlands to compensate for the destruction of 2.2 acres of existing wetlands for the mooring area. While the accuracy of a qualitative comparison of the wetland area which would be created versus that which would be destroyed is limited by inherent uncertainty of the exact nature of the wetlands which would be created, there is a fairly high probability that the species composition of the plant community inhabiting the created wetland would be similar to that of the existing wetlands. This is because the top layer of fill material in the borrow pits would be obtained from currently existing wetlands and would thus contain an abundance of viable seeds and bud-bearing plant parts of desirable wetland species. There is a potential, however, that the created wetlands may be comparatively short-lived because their location would be in a region of very calm water where sediment deposition and organic material accumulation would likely occur at a rapid rate, resulting in quick vegetational succession to a terrestrial plant community. To prevent this from occurring, the mitigation plan includes a provision to remove this sediment and organic material accumulation, as required.

7.13 Size of Discharge Sites. The size of the navigation structures covering approximately 2.7 acres is the minimum necessary to provide a safe entrance channel to the proposed boat harbor. The mooring area of slightly over 15 acres is the size which is required to provide a refuge space and

360 mooring spaces needed in the area. The wetlands area of roughly 5 acres which would be created is the amount needed to provide compensation for loss of other high quality wetlands. The size of the water control structure is determined by the rate of water flow in the marsh/swamp watershed which it would regulate.

7.14 Considerations to Minimize Harmful Effects. All appropriate considerations to minimize the harmful effects of the disposal of dredged or fill materials as defined in 40 CFR 230.5(c)(1-7) associated with the Geneva-on-the-Lake project have been considered in specifying the proposed disposal sites. These considerations, as summarized, include 40 CFR 230.5(c)(1) water quality criteria; (2) alternatives to open-water disposal; (3) physical characteristics of alternative disposal sites; (4) ocean dumping; (5) covering contaminated material with clean material; (6) minimize runoff from confined areas on the aquatic environment; and (7) coordination of potential monitoring activities with EPA.

8. Use of Materials from a Land Source and Mixing Zone Determinations.

8.1 Regulation 40 CFR 230.5(d) prohibits the discharge of fill materials from a land source when these materials are contaminated. The only land source material to be discharged in the Geneva-on-the-Lake project are rubblemound stone and mooring area excavated material which are believed to be free of anthropogenic contaminants.

8.2 Mixing zone determinations are not applicable in the case of the Geneva-on-the-Lake project as all discharges of dredged or fill materials would be of a confined nature or would be into receiving waters characterized by unconsolidated sediments and active water movement.

9. Conclusions and Determinations.

9.1 I have reviewed the documents pertinent to the construction of a small-boat harbor at Geneva-on-the-Lake, and have concluded that:

a. An ecological evaluation has been performed following the evaluation guidance contained in 40 CFR 230.4, in conjunction with the evaluation considerations in 40 CFR 230.5 (40 CFR 230.3(d)).

b. Appropriate measures have been identified and incorporated into the proposed plan to minimize adverse effects on the aquatic environment as a result of the discharge (40 CFR 230.3(d)(1)).

c. Consideration has been given to the need for the proposed activity, the availability of alternative sites and methods of disposal that are less damaging to the environment, and such water quality standards as are appropriate and applicable by law (40 CFR 230.5).

d. Some wetlands would be destroyed by construction of the project which would be compensated for by creation of a greater acreage of wetlands at the

currently non-wetland site. Secondary development of boating-related facilities in wetland areas would be controlled by the use of regulatory controls for the protection of wetlands.

10. Findings.

10.1 I find that the discharge of,

a. Entrance Channel Breakwaters	-	16,000 tons of rubblemound armor stone 5,200 tons of bedding stone 2,400 tons of underlayer stone
b. Entrance channel dredged material	-	4,000 cubic yards of sand and rock fragments.
c. Mooring area periphery stabilization material	-	4,250 cubic yards (8,500 square yards) of riprap material 40,500 square feet of diaphragm cell steel pile in-place
d. Wetland Construction	-	31,000 cubic yards of unpolluted excavated material
e. Water control structure	-	30 cubic yards of concrete 332 square feet of sheet steel 500 cubic yards excavated for spillway
f. Impermeable Boundary Layer Between Wetlands and Mooring Area	-	6,500 cubic yards of sand, gravel, and cobbles with a clay matrix

in Lake Erie, the proposed small-boat harbor, the existing wetlands and the existing excavated ponds at Geneva-on-the-Lake, OH, have been specified through application of Section 404(b)(1) of the Clean Water Act guidelines.

7/28/81
Date

GEORGE P. JOHNSON
Colonel, Corps of Engineers
Commanding

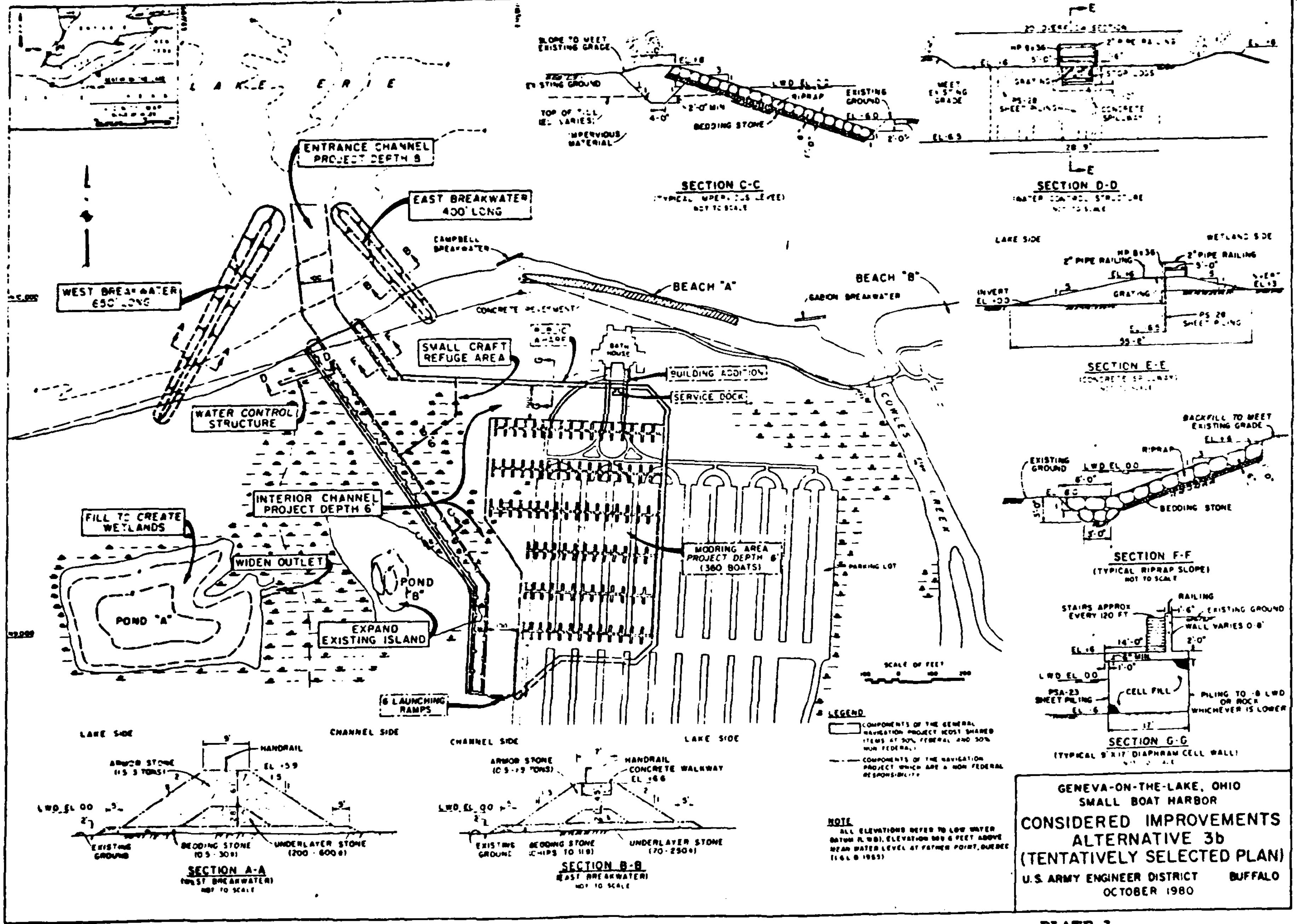

LAKE ERIE
ENTRANCE CHANNEL PROJECT DEPTH 8
EAST BREAKWATER 400' LONG
WEST BREAKWATER 650' LONG
CAMPBELL BREAKWATER
CONCRETE REVETMENT
BEACH "A"
BEACH "B"
GABION BREAKWATER
SMALL CRAFT REFUGE AREA
BATH HOUSE
BUILDING ADDITION
SERVICE DOCK
WATER CONTROL STRUCTURE
INTERIOR CHANNEL PROJECT DEPTH 6'
FILL TO CREATE WETLANDS
WIDEN OUTLET
POND "A"
POND "B"
EXPAND EXISTING ISLAND
MOORING AREA PROJECT DEPTH 6' (360 BOATS)
PARKING LOT
COWLES CREEK
6 LAUNCHING RAMPS
SCALE OF FEET
LEGEND
COMPONENTS OF THE GENERAL NAVIGATION PROJECT (COST SHARED ITEMS AT 50% FEDERAL AND 50% NON FEDERAL)
COMPONENTS OF THE NAVIGATION PROJECT WHICH ARE A NON FEDERAL RESPONSIBILITY
NOTE
ALL ELEVATIONS REFER TO LOW WATER DATUM (LWD), ELEVATION 569.6 FEET ABOVE MEAN WATER LEVEL AT FATHER POINT, QUEBEC (I.G.L.D. 1955)
SLOPE TO MEET EXISTING GRADE
EXISTING GROUND
TOP OF FILL (EL. VARIES)
IMPERVIOUS MATERIAL
RIPRAP
BEDDING STONE
LWD EL 0.0
SECTION C-C
(TYPICAL IMPERVIOUS LEVEE)
NOT TO SCALE
SECTION D-D
(WATER CONTROL STRUCTURE)
NOT TO SCALE
HP 8x36
2" PIPE RAILING
STOP LOGS
GRATING
PS-28 SHEET PILING
CONCRETE SPILLWAY
MEET EXISTING GRADE
LAKE SIDE
WETLAND SIDE
INVERT EL +0.0
SECTION E-E
(CONCRETE SPILLWAY)
NOT TO SCALE
BACKFILL TO MEET EXISTING GRADE
SECTION F-F
(TYPICAL RIPRAP SLOPE)
NOT TO SCALE
RAILING
STAIRS APPROX EVERY 120 FT
WALL VARIES 0-8'
CELL FILL
PSA-23 SHEET PILING
PILING TO -8 LWD OR ROCK WHICHEVER IS LOWER
SECTION G-G
(TYPICAL 9'x17' DIAPHRAM CELL WALL)
NOT TO SCALE
LAKE SIDE
CHANNEL SIDE
HANDRAIL
ARMOR STONE (1.5-3 TONS)
EL +5.9
BEDDING STONE (0.5-30#)
UNDERLAYER STONE (200-600#)
SECTION A-A
(WEST BREAKWATER)
NOT TO SCALE
ARMOR STONE (0.5-1.5 TONS)
CONCRETE WALKWAY
EL +6.6
BEDDING STONE (CHIPS TO 11#)
UNDERLAYER STONE (70-250#)
SECTION B-B
(EAST BREAKWATER)
NOT TO SCALE
GENEVA-ON-THE-LAKE, OHIO
SMALL BOAT HARBOR
CONSIDERED IMPROVEMENTS
ALTERNATIVE 3b
(TENTATIVELY SELECTED PLAN)
U.S. ARMY ENGINEER DISTRICT BUFFALO
OCTOBER 1980

PLATE 1

Re: Ashtabula County
Geneva-on-the-Lake
Grant of 401 Certification
Project to Dredge or Fill Materials into Waters in Lake Erie
Public Notice No. N/A

July 21, 1981

Department of the Army
Buffalo District Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Gentlemen:

Pursuant to Section 401 of the Federal Water Pollution Control Act, Public Law 95-217, the Ohio Environmental Protection Agency hereby certifies that the above-referenced project will comply with the applicable provisions of Sections 301, 302, 303, 306, and 307 of the Federal Water Pollution Control Act. This certification is specifically limited to a 401 certification with respect to water pollution and does not relieve the applicant of further certifications or permits as may be necessary under the law. This Certification is issued subject to the following conditions:

Extreme care must be employed during construction of the facility to avoid creation of unnecessary turbidity.

Fill used in this project will not be of a polluted nature.

Dredging will not occur during spawning periods in the spring, or during salmon runs in the fall. District Fish & Wildlife personnel should be contacted for guidance.

You are hereby notified that this action of the Director is final and may be appealed to the Environmental Board of Review pursuant to Section 3745.04 of the Ohio Revised Code by any person who was a party to this proceeding. The appeal must be in writing and set forth the action complained of and the grounds upon which the appeal is based. It must be filed with the Environmental Board of Review within thirty (30) days after the notice of the Director's action. A copy of the appeal must be served on the Director of the Ohio Environmental Protection Agency and the Environmental Law Division of the

EXHIBIT F-2c

Office of the Attorney General within three (3) days of the filing with the Board. An appeal may be filed with the Environmental Board of Review at the following address:

Environmental Board of Review
250 East Town Street
Room 101
Columbus, Ohio 43215

Very truly yours,

Wayne S. Nichols

Wayne S. Nichols
Director

WSN/rb

Copy to Division of Water, DNR
Copy to Office of Planning Coordinator, OEPA
Copy to Surveillance, OEPA

Geneva-on-the-Lake Small-Boat Harbor Study
Summary Minutes of 18 January 1979
Coordination Meeting of Corps and ODNR Personnel
Fountain Square, Building D, Columbus, OH

1. A meeting was held on 18 January 1979, in Columbus, OH, to review the results of the studies conducted to date on the small-boat harbor study and to come to a decision on what alternative harbor layouts are acceptable to the State of Ohio. The names of those persons in attendance are shown on the attached list. Chuck Gilbert opened the meeting at approximately 1:00 p.m. by welcoming all meeting participants and stated that the purpose of this meeting is to come to a mutual agreement on which preliminary harbor alternatives, developed by the Buffalo District, are acceptable to the State of Ohio. After the designs of these selected alternatives are completed, we will then hold a workshop meeting with ODNR, the U. S. Fish and Wildlife Service, and the Corps to review the results. Chuck then stated that for this meeting the Corps would first review the results of the studies conducted to date and then open the meeting to a general discussion of the alternatives.

2. Dick Aguglia reviewed the results of the seismic survey conducted at Geneva State Park to establish the top-of-rock profile in the area. Dick stated that the investigation confirmed the results of the boring program completed for the survey report which indicated that a trough exists in the bedrock that would allow a harbor to be constructed with no rock excavation. This trough runs generally east to west between Cowles Creek and the large pond in the wetland area and passes through the northern half of the existing parking lot. The seismic survey also indicated that a till layer overlays the bedrock in the Cowles Creek area. Based on our experience at Fairport Harbor, this till layer will be almost as costly to excavate as rock. ODNR will be provided with a copy of the seismic report when it is completed by the Corps.

3. John Lakatosh then reviewed the program currently in progress to assess the value of the wetland area. The U. S. Fish and Wildlife Service will conduct a four seasons survey on the Cowles Creek-wetland area-Lake Erie complex for the Buffalo District. The objectives of this study will be as follows:

a. to identify species composition, density, and distribution of the flora and fauna in the area;

b. to identify and evaluate the habitats important for major toxonomic groups; and

Exhibit F-3

c. to provide data and information that will allow assessment of the impacts of any structural plans that may be considered.

Based on a recent covnversation with the Fish and Wildlife Service, the preliminary data for the wetland area indicates that:

(1) the wetland area does not have a high productivity value for fisheries;

(2) the wetland area has a high productivity value for waterfowl; and

(3) the grassy areas bordering the wetland area have a high value for movement of mammals.

In addition to the four-seasons survey, the Fish and Wildlife Service will also collect water quality data on the wetland area (water quality data is currently available for Cowles Creek.) John also stated that the data will not be available for the Stage 2 report that will be completed in May. The environmental assessment required for this report will, therefore, be based on data that is currently available. The data from the four-seasons survey will be available, however, for the Environmental Impact Statement.

4. Chuck Gilbert asked if the marsh area by the cabins at the west end of the park (Wheeler Creek) could be considered as a possible site for mitigation measures. Jim Swartzmiller replied that this would be acceptable to ODNR. In that case, this marsh area will be included in the data collection program being conducted by the U. S. Fish and Wildlife Service.

5. Ralph Vanzant indicated that it may be inappropriate for the U. S. Fish and Wildlife Service to both collect the required environmental data and to assess the effects of any proposed harbor on the fish and wildlife resources of the area. Chuck Gilbert suggested that since ODNR is concerned about this, it would be a good idea to have one of their staff biologists assist the U. S. Fish and Wildlife Service in their data collection program.

6. Ron Guido then reviewed the results of the preliminary demand analysis conducted by the Corps. This demand analysis did not include the effect the proposed U. S. Steel Plant at Conneaut would have if it was built. The fleet mix that was generated from the demand analysis was based on our experience at Fairport Harbor. It is skewed towards cruisers since Lake Erie is not a good sailing area. Chuck Gilbert asked if this fleet mix appears reasonable. Norv Hall replied that he would get back to Ron after he has an opportunity to review it in detail.

7. Ron Guido then reviewed the methods the Corps will use to evaluate the benefits that will result from the project. Benefits from permanent-based boats are derived from the small-boat formula which is based on the depreciated value of the boat (for outboards this is 50 percent of the current purchase price.) Based on this formula, a 400-boat marina would provide about $200,000 average annual benefits and would support a project with a first cost of approximately $3,000,000 assuming a 50-year project life and 6-1/2 to seven percent interest rate. The benefits that result from launching facilities are calculated by converting it to an equivalent number of permanent-based boats. Other benefits include harbor-of-refuge benefits and pier fishing benefits. Ron will also investigate the possibility of using area development benefits although this type of benefit has been rejected in the past by Buffalo's Division Office (North Central.)

8. Dick Aguglia then reviewed the general design considerations for the preliminary harbor layouts formulated by the Corps. Two types of harbors were investigated:

a. a fair-weather harbor with day berthing for approximately 100 boats; and

b. an all-weather 400-boat marina.

With each alternative, the Corps tried to develop plans which would comply with the restrictions of rock elevation, the wetland area, and existing park facilities. These preliminary alternatives were formulated to outline the total range of alternatives that the Corps feels exist. Dick also reviewed the results of the Port Ontario harbor-of-refuge project on Lake Ontario with which the Corps is involved to illustrate the difference in cost between an offshore facility and an inland facility. The offshore facility had an estimated cost of $7,400,000 and the inland facility (of the same capacity) had an estimated cost of $3,500,000. Thus, the offshore facility would be approxiamtely twice as expensive to construct as the inland facility. The difference in cost was due to the following factors:

a. the increased size of the breakwaters required for the offshore facility; and

b. the increased length of the breakwaters required for the offshore facility.

Applying this factor of two to the estimated $3,200,000 cost of the authorized project at Geneva (with a B/C ratio of 1.2), the offshore facility has an estimated cost of $6,400,000 with a resultant B/C ratio of 0.6. Thus, it appears that an offshore facility at Geneva would not be economically feasible.

9. Roger Hubbell asked if the cost of mitigation is included in the cost of the project. Chuck Gilbert replied that it is included in the cost of the project and is also included in the developed B/C ratio. Therefore, the cost-sharing arrangements for mitigation measures would be the same as for the other features of the project (50 percent Federal and 50 percent non-Federal for the project at Geneva). Chuck also stated that if additional land is required, this cost would be entirely non-Federal because the local sponsor is required to supply all lands, easements, and rights-of-way.

10. Joan Pope then reviewed the results of the sounding program conducted to establish the offshore contours at Geneva State Park. There appears to be two areas where the eight-foot contour dips in towards shore:

a. opposite Cowles Creek; and

b. opposite the drainage outlet into the lake for the wetlands.

In order to avoid extensive offshore rock excavation (after about the four-foot contour, top of rock elevation is the same as the depth of water) the harbor entrance must utilize one of these two areas.

11. Joan Pope briefly reviewed the eight alternative harbor layouts formulated by the Corps and provided to ODNR prior to the meeting. Joan then stated that one alternative that was considered by the Corps, but subsequently rejected, was a rectangular-shaped harbor entirely within the wetland area. The reason why it was rejected was that we felt that storm-generated waves entering between the breakwaters would set up oscillations within the basin that could not be controlled.

12. A general discussion then took place. The main points discussed were as follows:

a. Jim Swartzmiller and Norv Hall stated that the State needs a harbor-of-refuge at Geneva State Park, therefore, Alternatives No. 5 and No. 6 (fair-weather harbors) should not be considered further. Also, due to their high cost, Alternatives No. 7 and No. 8 (offshore harbors) should not be considered further. Jim also stated that ODNR does not favor Alternative No. 1 (since it would isolate the bathhouse), but that the Corps should still consider it since this is the alternative the U. S. Fish and Wildlife Service favors. A bridge would be required to preserve access from the bathhouse to the bathing areas. Jim then stated that Alternatives No. 3 and No. 4 appear most feasible, but that they should go as far south in the wetland area as rock will allow before utilizing the existing parking lot.

b. Chuck Gilbert stated that the U. S. Fish and Wildlife Service normally requires the sponsoring agency to submit a mitigation plan for their review. Since it will not be known what items must be mitigated until the assessment of the area is completed, the State does not want to formulate a mitigation plan at this time. At the workshop meeting in March (see Item c), the State will take the position that they are agreeable to mitigation and will formlulate a plan after the area assessment is completed.

c. A workshop meeting will be held in March with ODNR, the U. S. Fish and Wildlife Service, and the Corps. At this time, the Corps will present the refined designs for Alternatives No. 1, No. 2, No. 3, and No. 4, cost estimates, and resultant benefit/cost ratios for review.

d. Dick Aguglia asked if the Corps should consider a harbor larger than 400 boats. Jim Swartzmiller replied that we should stay with a 400-boat harbor at this time. If a larger harbor is required to increase the B/C ratio, it can be discussed at the March workshop meeting.

13. Dick Aguglia then briefly summarized the decisions reached at this meeting as follows:

a. The Corps will refine Alternatives No. 1, No. 2, No. 3, and No. 4. While refining Alternatives No. 3 and No. 4, the Corps will go as far south in the wetland area as rock will allow before utilizing the existing parking lot.

b. Alternatives No. 5, No. 6, No. 7, and No. 8 should not be considered further.

c. Norv Hall will review the generated fleet mix and provide Ron Guido with his comments.

d. There will be a workshop meeting with ODNR, the U. S. Fish and Wildlife Service, and the Corps in March.

e. ODNR is agreeable to mitigation and will formulate a plan after the area assessment is complete.

f. The size of the marina will remain at 400 boats at this time.

14. Chuck Gilbert adjourned the meeting at 3:30 p.m.

1 Attachment
Attendees

RICHARD AGUGLIA
Project Manager

Geneva-on-the-Lake Small-Boat Harbor Study Coordination Meeting:
18 January 1979

Attendance

Name	Organization
James Swartzmiller	Chief Engineer, ODNR
Charles Gilbert	Chief, Planning, Branch, COE
Ralph Vanzant	ODNR
Fred Ball	ODNR
Roger Hubbell	ODNR
Norv Hall	ODNR
Robert Lucas	ODNR
Richard Aguglia	Planning Branch, COE
John Lakatosh	Environmental Section, COE
Joan Pope	Coastal Section, COE
Ron Guido	Economic Section, COE

GENEVA-ON-THE-LAKE SMALL-BOAT HARBOR STUDY
SUMMARY MINUTES OF 29 MAY 1979
COORDINATION MEETING OF CORPS, USF&WL, AND ODNR PERSONNEL
GENEVA STATE PARK, GENEVA-ON-THE-LAKE, OHIO

1. A meeting was held on 29 May 1979 at Geneva State Park to review the four alternative harbor plans developed by the Buffalo District and to come to a decision on the future course of the study. The names of those persons in attendance are shown on the attached list. Don Liddell opened the meeting at approximately 1:30 p.m. by welcoming all meeting participants and introducing the Corps personnel in attendance. Don then stated that the purpose of this meeting was to review the four alternative harbor layouts prepared by the Corps and to come to a decision on which harbor alternative was acceptable to both the U.S. Fish and Wildlife Service (USF&WL) and the Ohio Department of Natural Resources (ODNR). He explained that the alternatives that were developed take into consideration the existing and future park facilities and the existing wetland area. They run the spectrum from one alternative that preserves the wetland area to one alternative that preserves the existing and future park facilities. Don then stated that the alternatives should be considered as concepts that will have to be refined in later stages of the study if a decision can be reached on which harbor alternative is acceptable to both agencies. Don stressed the need for a mutually acceptable alternative since the Corps probably would not recommend construction of an alternative unless it was supported by both agencies.

2. Dick Aguglia stated that the rock profile in the area was also considered in developing these alternatives. The harbor alternatives were located to minimize rock excavation.

3. Dick Aguglia then briefly reviewed the four harbor alternatives. The main points discussed were as follows:

a. Alternative No. 1 (Cowles Creek Alternative) - Alternative No. 1 consists of a breakwater-protected entrance channel and an interior channel leading to a mooring area at the mouth of Cowles Creek for 100 boats and a mooring area in the parking lot area for 300 boats. The alternative also includes a sediment trap in Cowles Creek to prevent the sediment carried by Cowles Creek from entering the mooring area and the navigation channel. Besides disrupting a major portion of the parking lot, this alternative would also require the relocation of the existing foot bridge crossing Cowles Creek. The cost for removing this bridge would be a cost-shared item. However, the cost for replacing the bridge would be a non-Federal cost, although it is included in the benefit/cost ratio (b/c ratio).

In addition, due to the narrowness and orientation of the offshore trough in the rock which was utilized as the entrance channel for this alternative, the entrance conditions for boaters entering the harbor during storms are not as safe as the other alternatives investigated. Storms originating from the northwest would cause waves to strike the entering boat broadside. Boaters would also be required to turn immediately after entering the entrance channel. This alternative would also place boating activity in close proximity to swimming activities, creating an unsafe condition. The cost of this alternative is approximately $5,000,000, including $557,000 for lands and damages (includes the value of the land utilized by the harbor, the cost of the parking lot which is removed, and the depreciated value of the bathhouse due to reduced access), with a b/c ratio of 1.16 (the b/c ratio does not include the benefits for breakwater fishing or a cost for mitigation of adverse environmental impacts). The self-liquidating costs (mooring area, launching ramps, and public service facilities) are roughly estimated at $4,200,000.

Conrad Fjetland questioned whether it was appropriate to depreciate the value of the bathhouse due to reduced access since the bathhouse is presently not being used to any great extent. Conrad also asked if this alternative would create a beach in front of the bathhouse, since the predominate littoral drift in the area is from west to east, and thus increase the value of the bathhouse. Dick Aguglia replied that if a sand bypass is not provided, erosion of the bluffs and swimming area on the downdrift side of the breakwaters would occur. However, the State could truck in sand and create a beach in front of the bathhouse and the breakwater would help hold it in place.

b. Alternative No. 2 (Onshore-Offshore Alternative) - Alternative No. 2 consists of a breakwater-protected entrance channel, a breakwater-protected offshore mooring area for 300 boats, and an interior channel leading to an inland mooring area for 100 boats. The breakwaters required for this plan are approximately three feet higher than for the other alternatives in order to provide adequate protection for boats moored out in the lake. This alternative may also require the construction of an additional parking lot to the west of the harbor to service the offshore mooring area. The cost of this alternative is approximately $4,500,000, including $50,000 for lands and damages, with a b/c ratio of 1.26 (the b/c ratio does not include the benefits for breakwater fishing or a cost for mitigation of adverse environmental impacts). The self-liquidating costs are roughly estimated at $3,600,000 (does not include the cost of a possible parking lot to the west).

Due to the lack of biological information in the area, a mitigation plan for this alternative could not be formulated at this time.

Possible suggestions include a tree buffer zone between the wetland and the mooring areas and increasing the size of the ponds in the wetland area and building small islands within these ponds. In addition, since the existing drainage outlet for the wetlands will be affected, Buffalo District proposes to install an outlet control structure. This structure can be set at one elevation, or several outlet elevations can be incorporated to be used during different times of the year. The costs of these possible mitigation features have not been included in the b/c ratio for this or any other alternative.

c. Alternative No. 3 (Wetland-Parking Lot Alternative) - Alternative No. 3 consists of a breakwater-protected entrance channel and an interior channel leading to a mooring area for 60 boats and a mooring area for 340 boats. The alternative utilizes about one-quarter of the wetland area and one-quarter of the parking lot. The cost of this alternative is approximately $3,800,000, including $404,000 for lands and damages, with a b/c ratio of 1.51 (the b/c ratio does not include the benefits for breakwater fishing or costs for mitigation). The self-liquidating costs are roughly estimated at $4,100,000.

d. Alternative No. 4 (Wetland Alternative) - Alternative No. 4 consists of a breakwater-protected entrance channel and an interior channel leading to a mooring area for 160 boats and a mooring area for 240 boats. The alternative utilizes about half of the wetland area while leaving the existing parking lot intact. The cost of this alternative is approximately $3,100,000, including $78,000 for lands and damages, with a b/c ratio of 1.82 (the b/c ratio does not include the benefits for breakwater fishing or costs for mitigation). The self-liquidating costs are roughly estimated at $3,800,000.

4. Dick Aguglia then reviewed Executive Order 11990 which prohibits Federal participation in projects which destroy wetlands if a practical alternative to such construction exists. In view of this Executive Order, Buffalo District made a preliminary determination as to whether or not each alternative was "practical." Based on this interpretation, Buffalo District concluded that Alternatives No. 2 and No. 3 were practical alternatives. Buffalo District did not, however, feel that Alternative No. 1 was practical due to its major interruption to existing park facilities. Since it was considered that practical alternatives to construction in the wetland area exists, it was also concluded that Alternative No. 4 would not conform to Executive Order 11990 and therefore should be dropped from further consideration. Of the two practical alternatives, Buffalo District prefers Alternative No. 2 even though it costs more because it minimizes the impact on the wetlands and the existing park facilities.

5. Dick Aguglia then stated that for the remainder of the meeting we would like to have a position from the USF&WL Service and ODNR in order to come to an agreement on a preferred alternative. If we cannot come to an agreement, then we should decide on what future course the study should take.

6. Conrad Fjetland asked why the alternatives were designed to hold 400 boats and why the entrance channel was eight feet deep and the interior channel and mooring areas were six feet deep. Dick Aguglia replied that, based on experience at other harbors, 400 boats were the minimum needed to justify a project of this type. Also, ODNR has stated that this is the size harbor they prefer, although we may adjust it somewhat during later stages of the study. In regard to the depths for the channels and mooring areas, they were selected based on the conditions at similar harbors designed by the Corps. Workshops will be held with local boaters in the Summer of 1979 to ascertain their desires and needs and adjustments in depths, if required, will be made at that time.

7. Conrad further stated that he had two questions concerning the practicality of Alternative No. 1: (1) Would ODNR have to add more parking facilities if Alternative No. 1 was constructed? and (2) Since Alternative No. 1 would create a beach in front of the bathhouse, where would ODNR like to have a beach?

8. Dick Aguglia replied that, since a 400-boat marina would require approximately 1,000 parking spaces, ODNR would have to construct additional parking facilities if Alternative No. 1 was constructed (the existing capacity of the parking lot is 1,200 cars).

9. Jim Swartzmiller asked if a beach could be constructed in front of the bathhouse with Alternatives No. 2, 3, and 4 by building a groin field? Joan Pope replied that probably a breakwater plan would work better, but that this would have to be studied further. Dick Aguglia replied that a Section 103 Reconnaissance Report on Shoreline Erosion at Geneva State Park was completed in November 1977 and recommended that a Detailed Project Report (DPR) be completed. In the reconnaissance report, a groin field to create a beach in front of the bathhouse and increase the size of the beach east of Cowles Creek was found to be feasible. This would have to be studied further, however, in the DPR. Jim Swartzmiller stated that, under any circumstances, the State wants a beach in front of the bathhouse.

10. Conrad Fjetland stated that the direct impacts to the wetland area with Alternative No. 2 are minimal and its indirect impact, due to its proximity to the wetlands, could be mitigated. The indirect impact of interfering with the randomly fluctuating drainage outlet for the wetland area, however, could be significant. Conrad stated

they should have sufficient data available in October to make a determination as to whether or not this indirect impact is significant.

11. Don Liddell stated that, even though Buffalo District prefers Alternative No. 2, if ODNR and the USF&WL Service prefer either Alternative No. 1 or No. 3, we would have no objection. Buffalo selected No. 2 because it seemed the best compromise of the three alternatives. Buffalo does not feel that Alternative No. 4 would conform to Executive Order 11990.

12. Norv Hall stated that Alternatives No. 2 and No. 3 were over $1,000,000 more than Alternative No. 4, and Alternative No. 1 was over $2,000,000 more. This is a concern to ODNR and should be considered in determining the practicality of the alternatives.

13. Don Liddell stated that, in order to recommend Alternative No. 4, we would have to include a significant cost for mitigation. This additional cost would probably increase the cost for Alternative No. 4 to the same level as the other alternatives. Conrad Fjetland stated that the loss of the wetland with Alternative No. 4 could probably not be mitigated.

14. Don Liddell stated that he would like to have a position from ODNR. Jim Swartzmiller replied that they would have to study the alternatives in greater detail before they state their position. Before making their decision, they need the following information: (1) a breakdown of the self-liquidating costs; (2) plates of the four alternatives; (3) a plate showing top of rock and offshore contours; and (4) Buffalo District's interpretation of the practicality of the four alternatives in regard to Executive Order 11990. Dick Aguglia replied that this information would be provided to ODNR and the USF&WL Service. (Note: Information was supplied by letters dated 5 June 1979 and 13 June 1979).

15. Jim Swartzmiller also stated that ODNR does not want two beaches separated by a small-boat harbor. They want one continuous beach between the bathhouse and Beach B to the east of Cowles Creek.

16. Dick Aguglia summarized the results of the discussion to this point as follows:

a. The USF&WL Service, pending a determination of the significance of the randomly fluctuating drainage outlet for the wetland area, could accept Alternatives No. 2 or No. 3 with suitable mitigation. They would, however, prefer Alternative No. 1.

b. ODNR does not want Alternative No. 1 because it isolates the bathhouse and splits their beaches. They prefer Alternative No. 4 because it is the least costly alternative.

17. Conrad Fjetland replied that the USF&WL Service would prefer Alternative No. 2 over Alternative No. 3. In addition, he felt that the mitigation costs for this alternative would be minimal. Conrad also stated that his report, dated 4 May 1979, did not rule out Alternatives No. 1, 2, or 3. Alternative No. 4 would not, however, be acceptable since the damage to the wetlands could not be mitigated.

18. Jim Swartzmiller replied that, before making a decision, they must examine not only the construction costs of each alternative but also the operating costs for each alternative. Don Liddell requested that ODNR make this decision by 1 July 1979 in order that it may be incorporated into the Stage 2 report currently scheduled for the end of July.

19. Conrad Fjetland stated that, since the State desires a beach in front of the bathhouse, the cost of constructing this beach should be included in the analysis of the four alternatives. He also asked what the demand is for swimming facilities at Geneva State Park. John Zorich replied that Buffalo District is currently conducting a recreational beach demand analysis for the entire U.S. shore of Lake Erie for the International Joint Commission. The results of this study should be available in January 1980. ODNR will supply Buffalo with existing data on recreational use at Geneva State Park. In addition, ODNR will supply Buffalo with coliform data for Cowles Creek as per Paul Lang's request.

20. Don Liddell stated that in order to complete the Stage 2 report, as scheduled, we need comments from ODNR and the USF&WL Service by 1 July 1979. If it is required, we could also have another meeting in July to review their comments. Don then adjourned the meeting at 4:30 p.m.

RICHARD AGUGLIA
Project Manager

GENEVA-ON-THE-LAKE SMALL-BOAT HARBOR STUDY COORDINATION MEETING
29 MAY 1979

ATTENDANCE

Name	Organization
James Swartzmiller	Chief Engineer, ODNR
Conrad Fjetland	Supervisor, USF&WL Service
Don Liddell	Chief, Engineering Division, COE
Alan Brackney	USF&WL Service
Clyde Simmeren	ODNR
Norv Hall	ODNR
Roger Hubbell	ODNR
Mike Colvin	ODNR
Doug Burgett	ODNR
John Zorich	Planning Branch, COE
Richard Aguglia	Planning Branch, COE
Paul Lang	Environmental Section, COE
Joan Pope	Coastal Section, COE

Geneva-on-the-Lake Small-Boat Harbor Study
Summary Minutes of 26 June 1980
Coordination Meeting of Corps, USF&WS and ODNR Personnel
Geneva State Park, Geneva-on-the-Lake, OH

1. A meeting was held on 26 June 1980, at Geneva State Park to review the four alternative harbor plans developed by the Buffalo District during its Stage 2 investigation and the two alternative harbor plans developed by ODNR, and to reach agreement on the alternative harbor plan which should be recommended for further detailed study. In addition, once agreement is reached on the recommended harbor plan, a conceptual mitigation plan will also be developed. The names of those persons in attendance are shown on the attached list.

2. Mr. Charles Gilbert opened the meeting at 2 p.m., by welcoming all meeting participants and introducing the Corps personnel in attendance. He then stated that the purposes of this meeting were to select the alternative harbor plan which should be recommended for additional detailed study and to agree upon a conceptual mitigation plan for this alternative. The details of this mitigation plan would then be developed by the environmental staffs of the study participants at a second meeting scheduled for the following morning, 27 June 1980. Mr. Gilbert then turned the meeting over to Mr. Richard Aguglia.

3. Mr. Richard Aguglia stated that the Buffalo District developed four alternative harbor plans for a 400-boat marina during Stage 2 planning (Development of Intermediate Plans) and reviewed these alternatives with ODNR and the USF&WS at a meeting on 29 May 1979. As a result of this meeting, two alternatives, identified as Plans No. 2 (Offshore/Onshore Harbor) and No. 3 (Wetland/Parking Lot Harbor), were recommended for additional detailed study in the Stage 2 Report. In addition, ODNR subsequently recommended that two modified versions of Plan No. 3 (one for a 300-boat facility, and one for a 360-boat facility) also be investigated during Stage 3. Mr. Aguglia also stated that at a subsequent meeting between ODNR and the USF&WS in May 1980, these agencies agreed that Alternative Plan 3, or a modification of Plan 3 as previously recommended by ODNR, should be the plan recommended for additional detailed study. Therefore, the first item to be decided is which version of Plan 3 should be developed in detail during Stage 3 planning.

4. Before selecting the alternative, Mr. Aguglia briefly reviewed the three plans under consideration as follows:

a. Alternative Plan No. 3 (see Incl 2 to Incl 1) - Alternative Plan No. 3 consists of a breakwater protected entrance channel and an interior channel leading to a mooring area for 60 boats, and a second mooring area for 340 boats. The breakwaters were designed to limit wave heights to a maximum of 3 feet in the entrance channel and a maximum of 1 foot in the interior channels and mooring areas. The depth of the entrance channel is 8 feet below Low Water Datum (LWD), and the depth of the interior channel is 6 feet below LWD.

Incl 1

EXHIBIT F-5

b. Alternative Plan No. 3a (see Incl 3 to Incl 1) - Alternative Plan 3a consists of a breakwater protected entrance channel similar to Plan 3 and an interior channel leading to a single mooring area for 300 boats. In addition, Plan 3a includes a refuge area for small craft in the northwest corner of the marina and an additional temporary mooring area for trailored boats adjacent to the launching ramps. The depths of the entrance and interior channels are the same as for Plan No. 3.

c. Alternative Plan No. 3b (see Incl 4) - Alternative Plan No. 3b is similar to Plan 3a except that the mooring area has been expanded to accomodate 360 boats instead of 300 boats. In addition, the service building and service area have been relocated to the north, to coincide with the existing bathhouse.

Mr. Aguglia then stated that the Corps could support Plan 3, or either of the modified versions of Plan 3 as suggested by ODNR, for additional detailed study and asked for the opinion of ODNR and the USF&WS.

5. Mr. Swartzmiller replied that ODNR would prefer Plan 3b, since it would provide 60 more slips than Plan 3a, and would also allow them to convert the existing bathhouse into a dual purpose facility. Mr. Kroonemeyer replied that although they think that Alternative Plan No. 2 (Offshore/Onshore Harbor) is the best plan, they would support Plan 3b as the selected plan. Therefore, Plan 3b was selected as the plan that should be developed in detail during Stage 3.

6. A conceptual mitigation plan for Alternative Plan 3b was then developed. Components of this mitigation plan included the following (see Incl 5):

a. Creation of new wetlands by filling a portion of Pond A in order to replace the wetlands destroyed by Plan 3b.

b. Expansion of the existing island in Pond B in order to create additional habitat for waterfowl that is protected from predators.

c. A water control structure at the mouth of the intermittent stream that runs through the wetlands, in order to artificially regulate the level of water in the wetlands.

d. Planting of shrubs along the west wall of the marina in order to shield the wetlands from the marina activities.

It was also decided that details of these components would be developed by the environmental staffs of the study participants at a second meeting scheduled for the following morning.

7. Mr. Richard Aguglia then led a general discussion on specific components of Plan 3b. The main points of this discussion are as follows:

a. Mr. Aguglia asked ODNR if they would object to eliminating the jog in the harbor wall along the west side of the marina in order to reduce the amount of wetlands destroyed by Plan 3b. Mr. Swartzmiller replied that this

would be agreeable to ODNR if the remaining refuge area would meet Corps criteria. Mr. Aguglia relied that the remaining refuge area would meet Corps criteria. In addition, Mr. Aguglia noted that additional refuge area is available along the public warf and adjacent to the launching ramps for boaters seeking a sheltered mooring during a storm.

b. Mr. Swartzmiller asked if a Federal channel could be provided along the north wall of the marina in order to provide access to the service dock in addition to the Federal channel leading to the launching ramps. Mr. Swartzmiller also noted that Federal channels to both the service dock and launching ramps have been provided at other harbors in Ohio. Mr. Aguglia replied that he would have to investigate this further when he returned to the Buffalo Office. (NOTE: Subsequent investigations revealed that Federal channels can be provided to both launching ramps and service docks. Therefore, Plan 3b will be modified to include an additional Federal channel to the service dock.)

c. Mr. Aguglia then asked what type of walks (i.e., sloped or vertical) should be included in Plan 3b. Mr. Aguglia also stated the Corps concern that if two vertical walls are placed opposite each other, wave reflections off these walls would result in unacceptably high waves in the mooring basin. Based on the discussion that followed, it was decided that the west wall and the south wall would be sloped and that the north wall and the east wall would be vertical. Mr. Swartzmiller also stated that ODNR plans on installing floating docks instead of permanent docks which will help dampen any wave activity in the mooring basin. (NOTE: Based on a subsequent conversation with Mr. Swartzmiller at a workshop meeting with local boaters on 23 July 1980, the south wall will be vertical. If model studies indicate that this would result in unacceptable wave conditions in the mooring basin, the south wall will then be changed to a sloped wall.)

d. Mr. Aguglia also asked ODNR if they intended to provide additional parking areas to accommodate both the marina and beach activities. Mr. Swartzmiller replied that they are currently developing a new parking plan that extends the existing parking lot to the north and also modifies the south end of the parking lot to accommodate the launching ramp activities. Mr. Swartzmiller also noted that they are developing this plan based on three-quarter parking spaces per mooring slip, and sufficient area to park 50 cars and boat trailors per launching ramp. Based on experience at other harbors, this is expected to be adequate. Mr. Swartzmiller said that he would send a plan of the proposed new parking area to the Buffalo District in the near future.

e. Mr. Aguglia asked ODNR if they would also supply the Corps with a plan of their proposed marina facility indicating the types of services they will be providing (i.e., water and electricity to each dock, marina lighting, etc). Mr. Swartzmiller replied that at this time the only facilities they will commit themselves to are the facilities called for in the items of local cooperation. They will, however, provide the Buffalo District with a list of facilities they are currently considering but will not commit themselves to these items.

f. Mr. Robert Klips asked ODNR if they plan on developing the wetland area for educational purposes, perhaps with trails, as part of the proposed nature center shown of the Park Master Plan. Mr. Swartzmiller replied that ODNR has no such plans.

g. Mr. Philip Berkeley asked ODNR if they could provide the Corps with a letter stating that the use of the wetlands as a mitigation area for the life of the small-boat harbor project was consistent with the park's development plan. Mr. Swartzmiller replied that since existing 404 Regulations would prohibit any development in the wetlands no other assurances would seem to be required. They will, however, provide the Corps with a letter stating that the use of the wetlands as a mitigation area is consistent with the Park Plan.

8. The final topic discussed concerned providing recreational fishing facilities (i.e., concrete walkway and safety railings on the harbor breakwaters) as a project feature. Mr. Aguglia stated that the demand analysis conducted during Stage 2 indicated that the existing shore-based fishing capacity will exceed fishing demand for the entire 50-year project life. Therefore, in order to economically justify any recreational fishing facilities, the user day value for breakwater fishing must be greater than the user day value for shore-based fishing. Mr. Aguglia also stated that because of the low demand, extensive facilities, such as extending the breakwaters, would probably not be justified. In view of this, it was agreed that fishing facilities would only be provided on the east breakwater. In addition, the U.S. Fish and Wildlife Service will provide the Buffalo District with the appropriate user day values for breakwater fishing and shore-based fishing to be used in their economic evaluation.

8. Mr. Charles Gilbert then adjourned the meeting at 3:30 p.m.

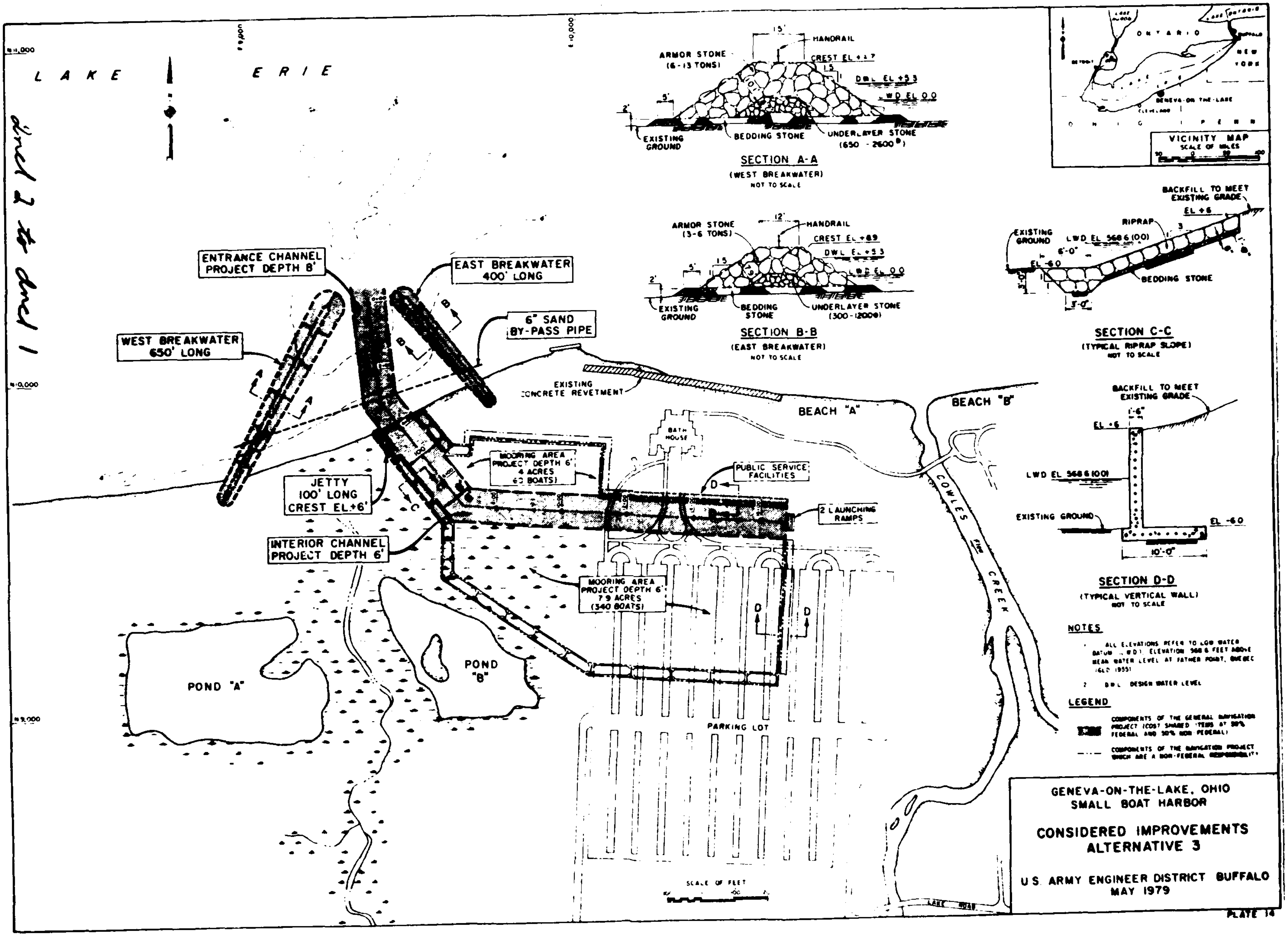
RICHARD AGUGLIA
Project Manager

Geneva-on-the-Lake Small-Boat Harbor Study
Coordination Meeting: 26 June 1980

ATTENDANCE

Name	Organization
James Swartzmiller	Chief Engineer, ODNR
Kent Kroonemeyer	Supervisor, USF&WS
Charles E. Gilbert	Chief, Pl[illegible]ng Branch, COE
Clyde Simmer	ODNR
Eric Angle	ODNR
Norv Hall	ODNR
Doug Burgett	ODNR
Robert Lucas	ODNR
Larry K. Henry	ODNR
Lynn Mac Lean	USF&WS
Richard Aguglia	Planning Branch, COE
Philip E. Berkeley	Environmental Section, COE
Robert A. Klips	Environmental Section, COE
Denton R. Clark, Jr.	Chief, Coastal Section, COE

Incl 1 to Incl 1



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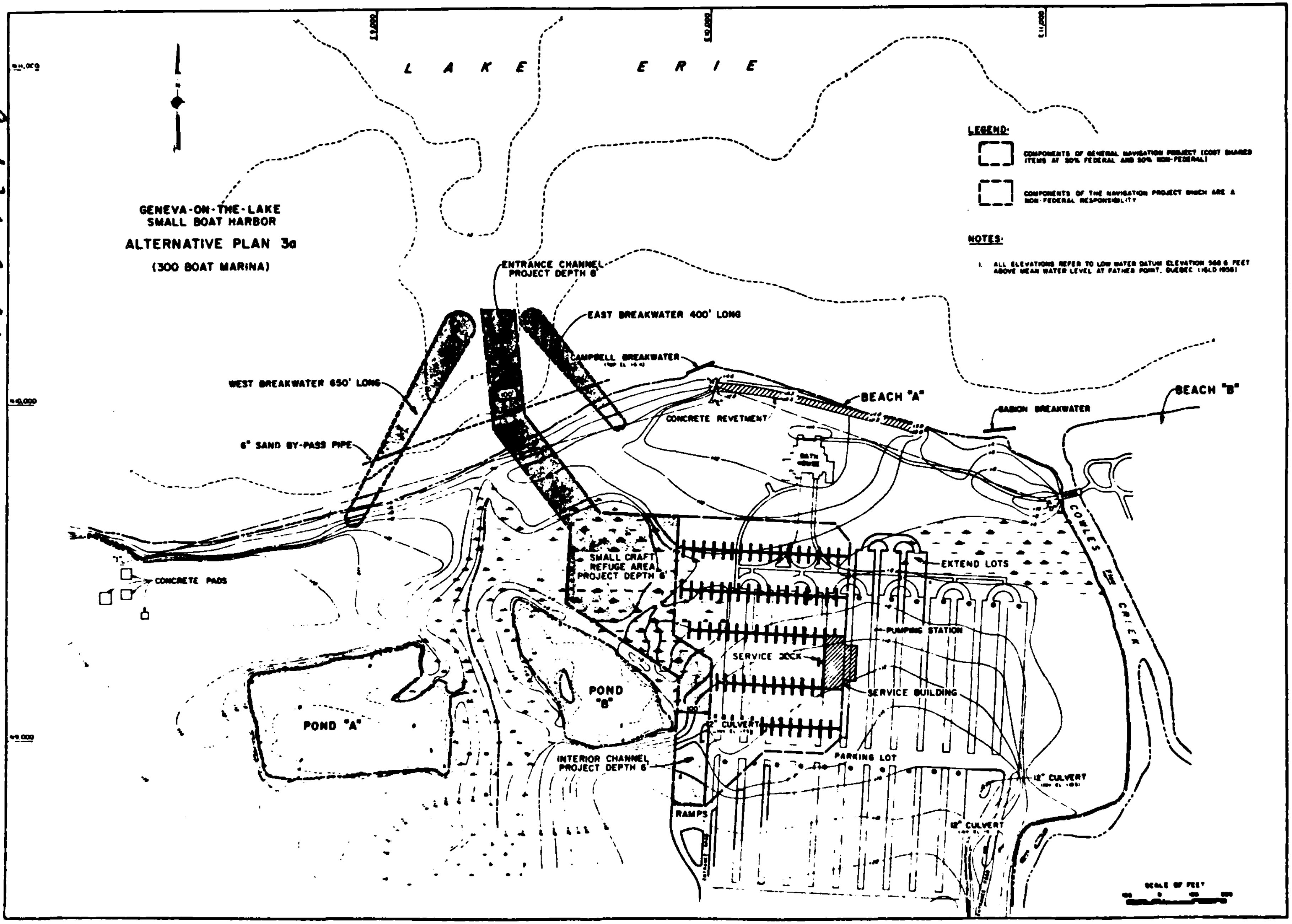
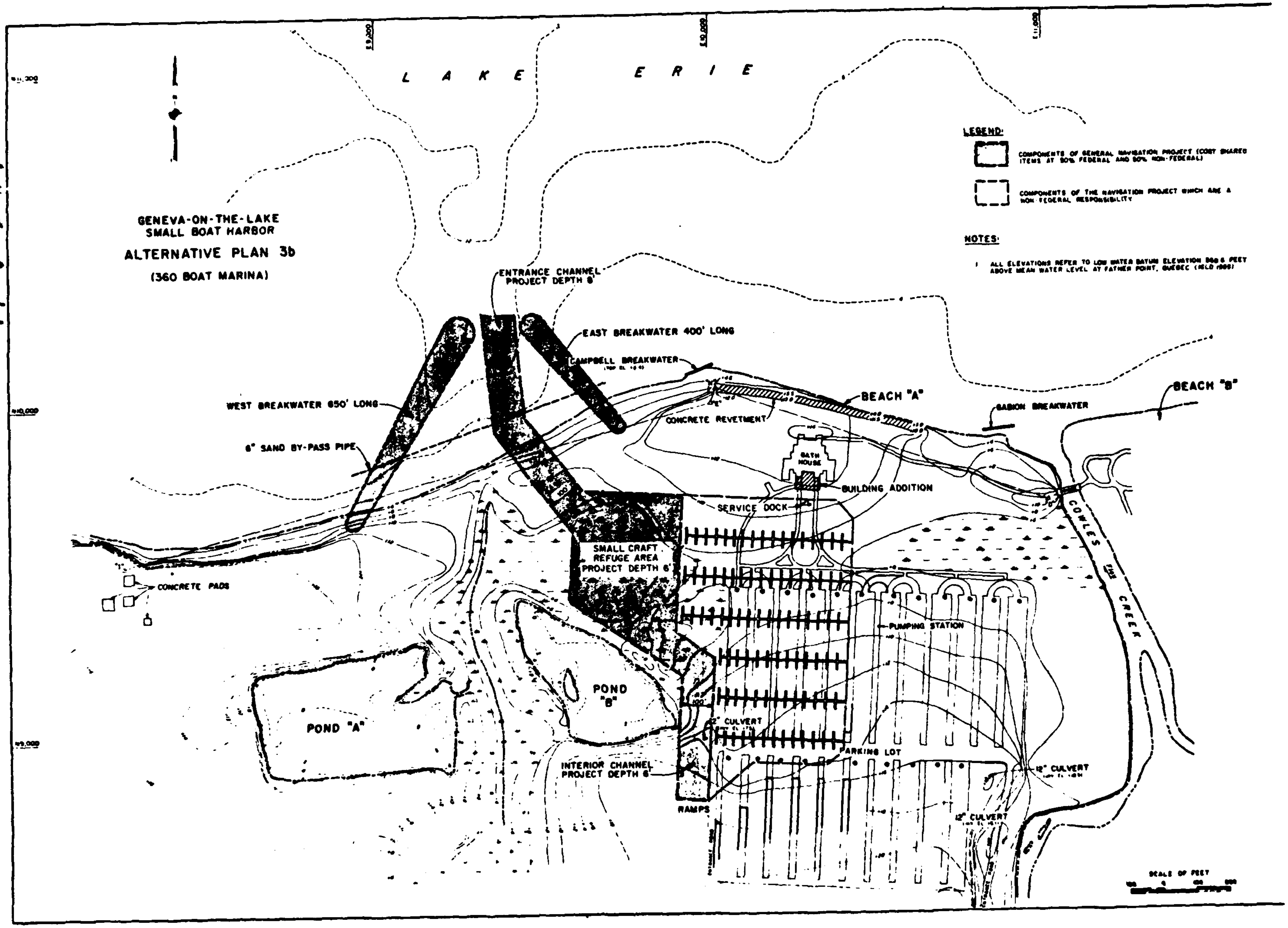
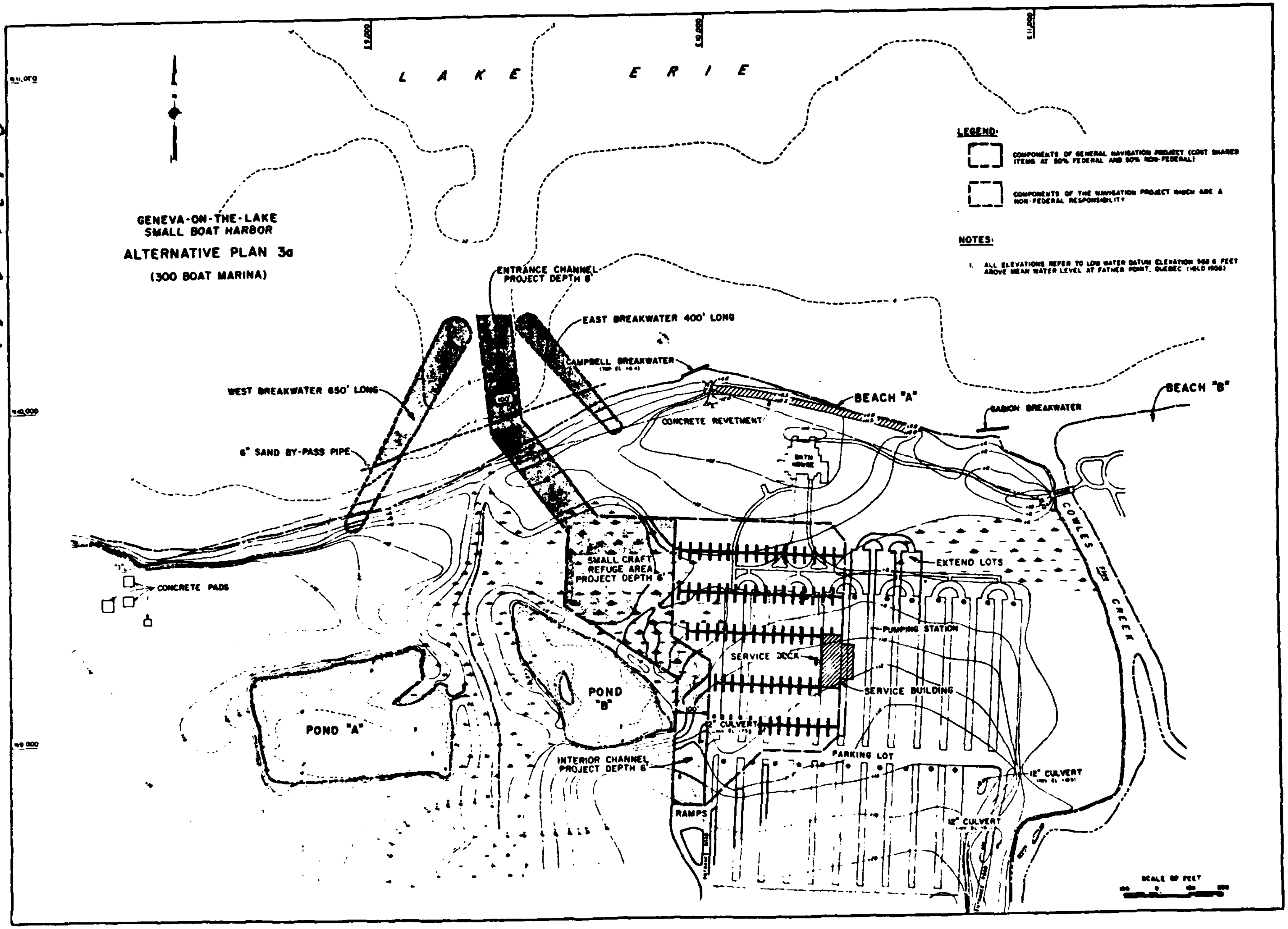


Incl 3 to Incl 1

Incl 4 to Incl 1





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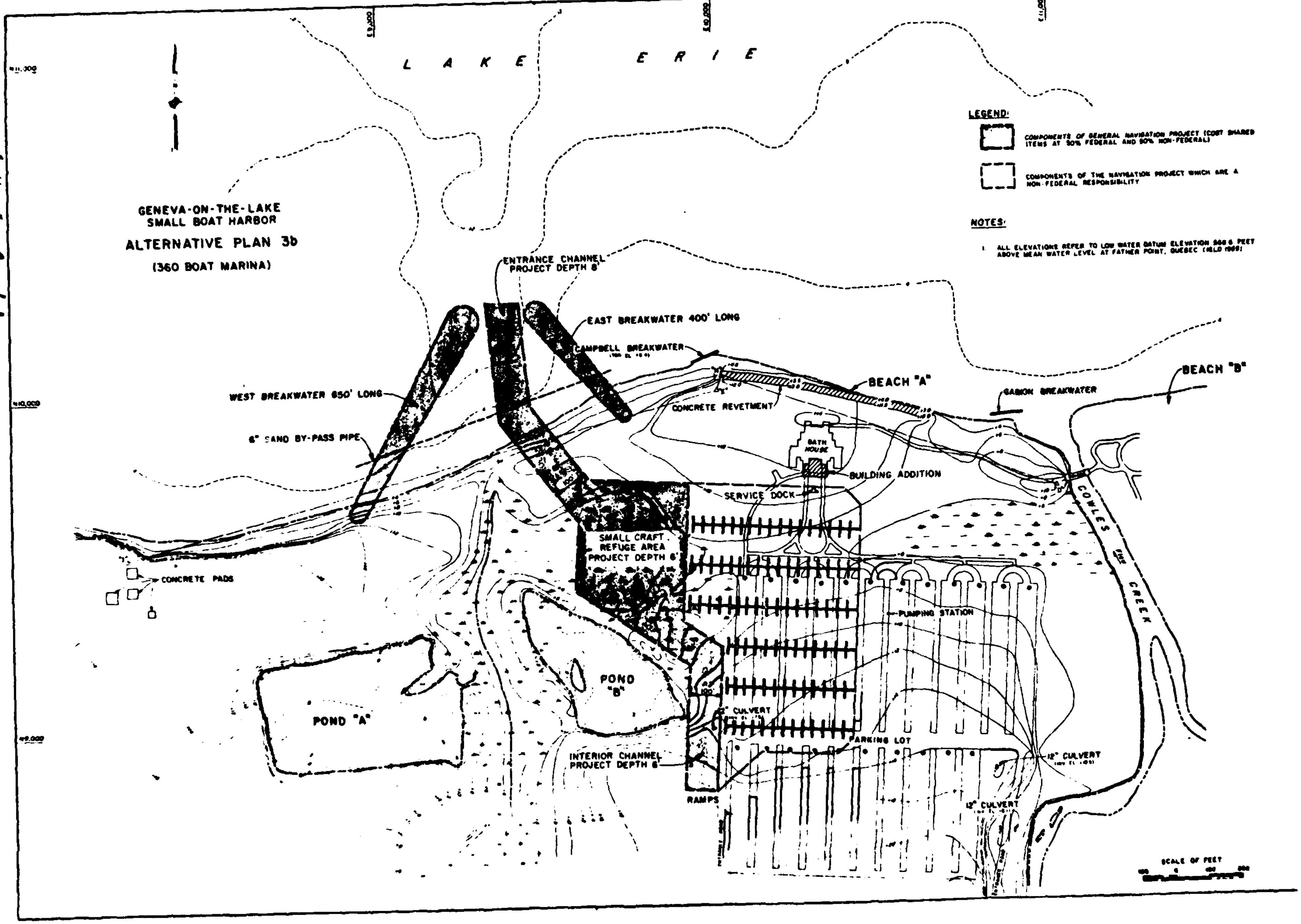

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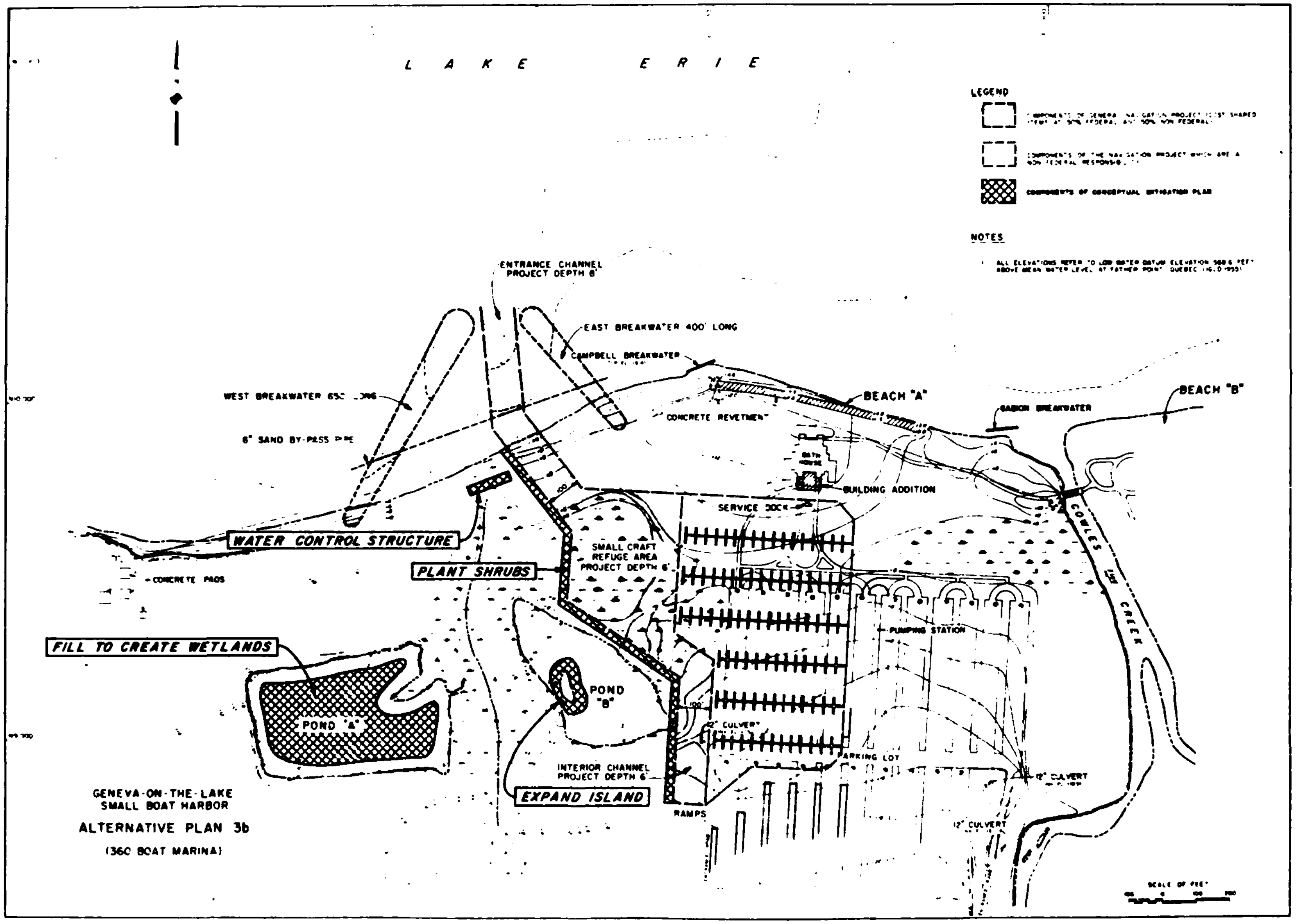


GENEVA-ON-THE-LAKE SMALL BOAT HARBOR

ALTERNATIVE PLAN 3b

(360 BOAT MARINA)

Incl 5 to Incl 1

Geneva-on-the-Lake Small-Boat Harbor Study
Summary Minutes of 27 June 1980
Coordination Meeting of Corps and USF&WS Personnel
Geneva State Park, Geneva-on-the-Lake, OH

1. A meeting was held on 27 June 1980, at Geneva State Park in order to agree upon the details of the conceptual mitigation plan that was developed at the 26 June 1980 meeting between the Buffalo District, Ohio Department of Natural Resources, and U.S. Fish and Wildlife Service. The names of those persons in attendance are shown on the attached list (Incl 1).

2. Based on the discussion that ensued, the following items were agreed upon (see Incl 2):

a. The west wall of the harbor will be raised to +8 LWD. In addition, this wall will be constructed of impervious material in order to allow different water levels to be maintained in the wetlands and the marina. Also, Red-Osier Dogwood will be planted along this wall (from the top of the wall to +6 LWD on the wetland side) in order to shield the wetlands from the marina activity.

b. Pond A will be filled in to create additional wetlands, as shown on Incl 2, in order to replace the wetlands destroyed by the harbor plan. A moat will also be provided around the perimeter of this new wetland area (bottom elevation LWD) in order to isolate the wetlands and provide protection from predators. In addition, the existing outlet of Pond A will be widened.

c. The existing island in Pond B will be expanded to create additional habitat for waterfowl. The top elevation of this island will be +8 LWD.

d. A water control structure will be provided at the mouth of the intermittent stream that runs through the wetland. This structure will be capable of controlling the level of water in the wetlands between LWD and +6 LWD. (NOTE: Because the bottom of the existing streambed is at +3.0 to +4.0 LWD, these limits were subsequently changed to between +3 LWD and +6 LWD.)

3. The meeting was then adjourned at 11:30 a.m.

Richard Aguglia
RICHARD AGUGLIA
Project Manager

Incl 2

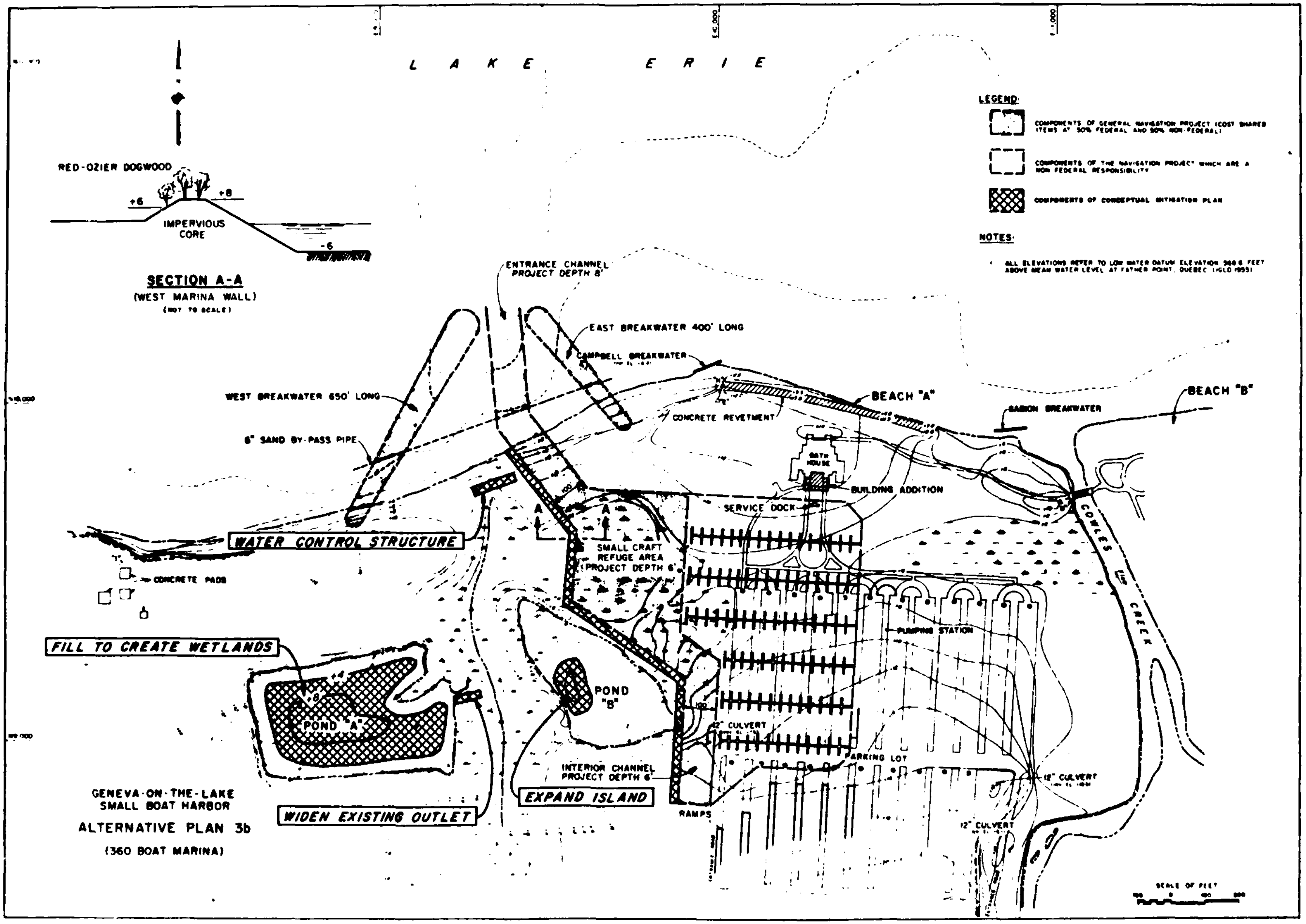
EXHIBIT F-6

Geneva-on-the-Lake Small-Boat Harbor Study
Coordination Meeting: 27 June 1980

ATTENDANCE

Name	Organization
Kent Kroonemeyer	Supervisor, USF&WS
Lynn Mac Lean	USF&WS
Philip E. Berkeley	Environmental Section, COE
Robert A. Klips	Environmental Section, COE
Richard Aguglia	Planning Branch, COE

Incl 1 to Incl 2



Incl 2 to Incl 2

Geneva-on-the-Lake Small-Boat Harbor Study
Summary Minutes of 23 July 1980
Coordination Meeting of Corps, ODNR and Local Boaters
Holiday Inn, Austinburg, Ohio

1. A meeting was held on 23 July 1980, at the Holiday Inn, Austinburg, Ohio, to review the small-boat harbor alternative selected for additional detailed study at the 26 June 1980 workshop meeting involving the Buffalo District, the Ohio Department of Natural Resources (ODNR), and the U. S. Fish and Wildlife Service (USF&WS) and to consider specific channel width and depth requirements for power boats and sailboats. The names of those persons in attendance are shown on the attached list (Incl 1). Mr. Don Liddell opened the meeting at approximately 7:30 p.m. by welcoming all meeting participants and introducing the Corps personnel in attendance. Mr. Liddell then stated that the purposes of this meeting were to review the alternative harbor plan selected for additional detailed study and to determine specific channel width and depth requirements for power boats and sailboats. We would also like to review the Buffalo District's projection of the fleet expected to use a small-boat harbor at Geneva State Park and the range of drafts for this fleet. Mr. Liddell also mentioned that the harbor plan selected for additional study was formulated to minimize costly rock excavation since top of rock is near the surface at Geneva State Park. Mr. Liddell then turned the meeting over to Mr. Dick Aguglia.

2. Mr. Dick Aguglia stated that Section 6 of Public Law 79-14, approved 2 March 1945, authorized and directed the Secretary of War to cause preliminary examinations and surveys to be made on the south shore of Lake Erie with a view to the establishment of harbors and harbors-of-refuge for light draft commercial and fishing vessels and for recreational craft. In partial compliance with this authority, a comprehensive preliminary examination report, favorable to 33 locations, was submitted on 19 July 1946. Preparation of survey reports thereon was authorized by the Chief of Engineers on 20 December 1946. The purpose of these survey reports was to determine if Federal participation in each project was economically and environmentally feasible.

3. Mr. Aguglia then stated that the survey report for Geneva State Park was completed in 1969 and included a favorable recommendation for the harbor project. This report also identified ODNR as the local sponsor for the project. The project was subsequently authorized for construction under Section 201 of the 1965 Flood Control Act (PL 89-298) by the House and Senate Committees on Public Works by Resolutions dated 15 December 1970 and 17 December 1970, resepectively. The project, as authorized, included the following features (see Incl 2 to Incl 1): (1) breakwaters in Lake Erie aggregating about 1,400 feet in length; (2) an entrance channel about 1,000 feet long and varying from 180 to 100 feet in width, 8 feet deep for the outer 500 feet and 6 feet deep for the inner 500 feet; (3) a dock channel, 100 feet wide, 1,500 feet in length and 6 feet deep, widened to 200 feet at the junction with the entrance channel; and (4) development of recreational fishing facilities.

Incl 1

EXHIBIT F-7

4. Mr. Aguglia stated that although the project was authorized for construction in 1970, funds to initiate the Advanced Engineering and Design (AE&D) of the project were not appppropriated until October 1977. At that time, the Buffalo District initiated a Reformation Phase I General Design Memorandum, the first phase of AE&D. Reformulation was required because of several legislative and physical changes, having a direct influence on the feasibility of constructing the authorized project, that had occurred since the 1969 Interim Report was submitted to Congress and subsequently authorized for construction. These changes, depicted on Incl 3 to Incl 1 include: (1) the construction of a parking lot at the location originally proposed for the mooring area; and (2) expansion of an existing wetland area within the location originally proposed for the launching area and turning basin with increased emphasis through legislative changes on preservation of this wetland area for environmental reasons. During Stage 2 planning (Development of Intermediate Plans) for the Reformulation Phase I GDM, the Buffalo District developed a range of alternatives that considered these changes. These alternatives ran the spectrum from offshore alternatives to alternatives that preserved the existing wetland area to alternatives that preserved the existing and future park facilities. Based on subsequent review and analysis of these alternatives by the Buffalo District, ODNR and the USF&WS, Alternative Plan 3b was selected as the preferred alternative for additional detailed study.

5. Mr. Dick Aguglia then briefly reviewed Alternative Plan 3b (see Incl 4 to Incl 1), which consists of a breakwater-protected entrance channel and interior channels leading to a fuel dock and to four launching ramps and a mooring area for 360 boats. This alternative also includes a refuge area for small craft in the northwest corner of the marina. The breakwaters were designed to limit wave heights to a maximum of 3 feet in the entrance channel and a maximum of 1 foot in the interior channels and mooring areas. The depth of the entrance channel is 8 feet below Low Water Datum (LWD) and 6 feet below LWD for the interior channels. The alternative also includes a mitigation plan to compensate for project induced environmental impacts. Mr. Aguglia then asked if there was any comments on this plan and whether or not this plan would serve the needs of the local boaters. Mr. Carl Horst asked how many slips would be reserved for transient craft? Mr. Aguglia replied that during Stage 2, the Buffalo District assumed that four slips would be reserved for transient craft, however, the exact number was up to ODNR. Now Hall stated that at this time ODNR is anticipating reserving about 20 slips for transient boats. Mr. Bill Hyslop asked if additional parking would be required since the harbor plan displaces part of the existing parking lot? Mr. Jim Swartzmiller replied that ODNR is currently preparing a new parking plan that expands the existing parking lot to the north. Currently they are planning on providing 300 spaces for the mooring basin, 240 spaces for the launching ramp activities, and 600 spaces for the beach activities. A question was also asked if waves entering between the breakwaters would result in unacceptable wave heights in the mooring basin. Mr. Aguglia replied that this would be investigated in the model study which the Corps' Waterways Experiment Station is currently starting. If the model study indicates unacceptable wave heights, modifications will be incorporated

into the plan to reduce the waves to maximum of 1 foot. Mr. Carl Horst also suggested that consideration be given to incorporating an underground pipe between the mooring basin and the lake in order to provide flushing of the basin.

6. Since there were no further comments on Alternative Plan 3b, Dick Aguglia suggested that required channel depths be considered next. Dick also suggested that the following formula, which the Corps has used in other studies, be used to determine channel depth; channel depth = mean stage - vessel draft - 1/2 wave height - pitch. Workshop participants discussed each of the factors in this relationship and agreed to the following values for the above channel depth equation:

a. Mean Stage - It was agreed that Low Water Datum (elevation 568.6) would be used for the mean stage. This level is the lowest monthly mean level for any month - April through November - having a 95 percent chance of being equalled or exceeded in any one year. It was also noted that the 5 percent of the time that the level is below LWD is normally during late fall (October and November).

b. Vessel Draft - Participants reviewed the data in Table 1 - Expected Fleet Mix at Geneva State Park (Incl 5 to Incl 1) and Table 2 - Average Fleet Draft (Incl 6 to Incl 1) and agreed that the entrance channel should be designed for a 6-foot draft, which would accommodate the entire fleet, and that the interior channels should be designed for a 5-foot draft. The interior channels would then be able to accommodate about 90 percent of the expected fleet during design conditions and the entire fleet when the average lake level was above LWD. It was also noted that the Corps normally dredges 1-foot below project depth in soft material and 2-foot below project depth in hard material which would help alleviate any problem the deeper draft boats may encounter in reaching their berths. In addition, it was decided that the western end of the interior channel leading to the fuel dock would be designed for a boat with a 6-foot draft. This would then provide a temporary mooring area for these boats during low water conditions. Mr. Norm Schultz asked what the difference was between the 16-25-foot inboard classification and the 16-25-foot cruiser classification. Mr. Don Liddell replied that cruisers include sleeping accommodations. Norm then stated that, with the trend towards more luxurious accommodations that has been noted in recent years, the expected number of these boats, as shown in Table 1 (Incl 5 to Incl 1), should be reversed (i.e., 53 cruisers and 27 inboards). Mr. Bill Hyslop asked how the fleet mix shown in Table 1 was developed. Miss Joan Pope replied that the fleet mix was developed based on the existing fleets in use at Ashtabula and Fairport Harbors. (Note: The fleet mix shown on Table 1 was prepared for the Stage 2 Report which assumed a 400-boat marina. The size of the marina was subsequently reduced to 360 boats and therefore, the fleet mix will be revised during Stage 3. However, the proportion of boats in each size classification should remain the same.)

c. Allowance for Wave Height - Based on the breakwater design criteria, allowable wave heights in the entrance channel is 3 feet, and in the interior channels is 1 foot. Therefore, 1/2 the wave height is 1.5 feet for the entrance channel and .5 feet for the interior channels.

d. Allowance for Pitch - It was agreed that a 1/2-foot allowance for pitch in the entrance channel and a 1/4-foot allowance for pitch in the interior channels was sufficient.

e. Summary - In summary, required depths for the entrance and interior channels are as follows:

(1) Exterior Channel = (568.6) - (6-foot vessel draft) - (1-1/2-foot allowance for wave height) - (1/2-foot allowance for pitch) = 560.6 (8 feet below LWD)

(2) Interior Channel = (568.6) - (5-foot vessel draft) - (1/2-foot allowance for wave height) - (1/4-foot allowance for pitch) = 562.8 - (5.8 feet below LWD, say 6 feet)

7. The next item discussed was the required channel widths. All participants agreed that a 100-foot wide channel width was sufficient for the expected fleet at Geneva State Park.

8. Mr. Don Liddell then thanked all participants for attending and adjourned the meeting at 9:30 p.m.

RICHARD AGUGLIA
Project Manager

Geneva-on-the-Lake Small-Boat Harbor Study
Summary Minutes of 23 July 1980
Coordination Meeting of Corps, ODNR and Local Boaters
Holiday Inn, Austinburg, Ohio

ATTENDANCE

Name	Organization
James Swartzmiller	Chief Engineer, ODNR
David J. Cencula	ODNR
Norv Hall	ODNR
Jeff Hall	ODNR
Ken Alvey	ODNR
Eric Metzier	ODNR
Norm Schultz	Lake Erie Marine Trades
Bill Nurmiwen	Brockway Marine
Dave Lomas	Geneva-on-the-Lake Village Council
Charles Gunn	Coast Guard Station, Ashtabula
Carl Horst	Marine Advisory Board
Bill Hyslop	Resident
Eric P. Schneider	Greater Cleveland Boating Association
Donald M. Liddell	Chief, Engineering Division - COE
Joan Pope	Coastal Section - COE
Bob Webster	Planning Branch - COE
Dick Aguglia	Planning Branch - COE

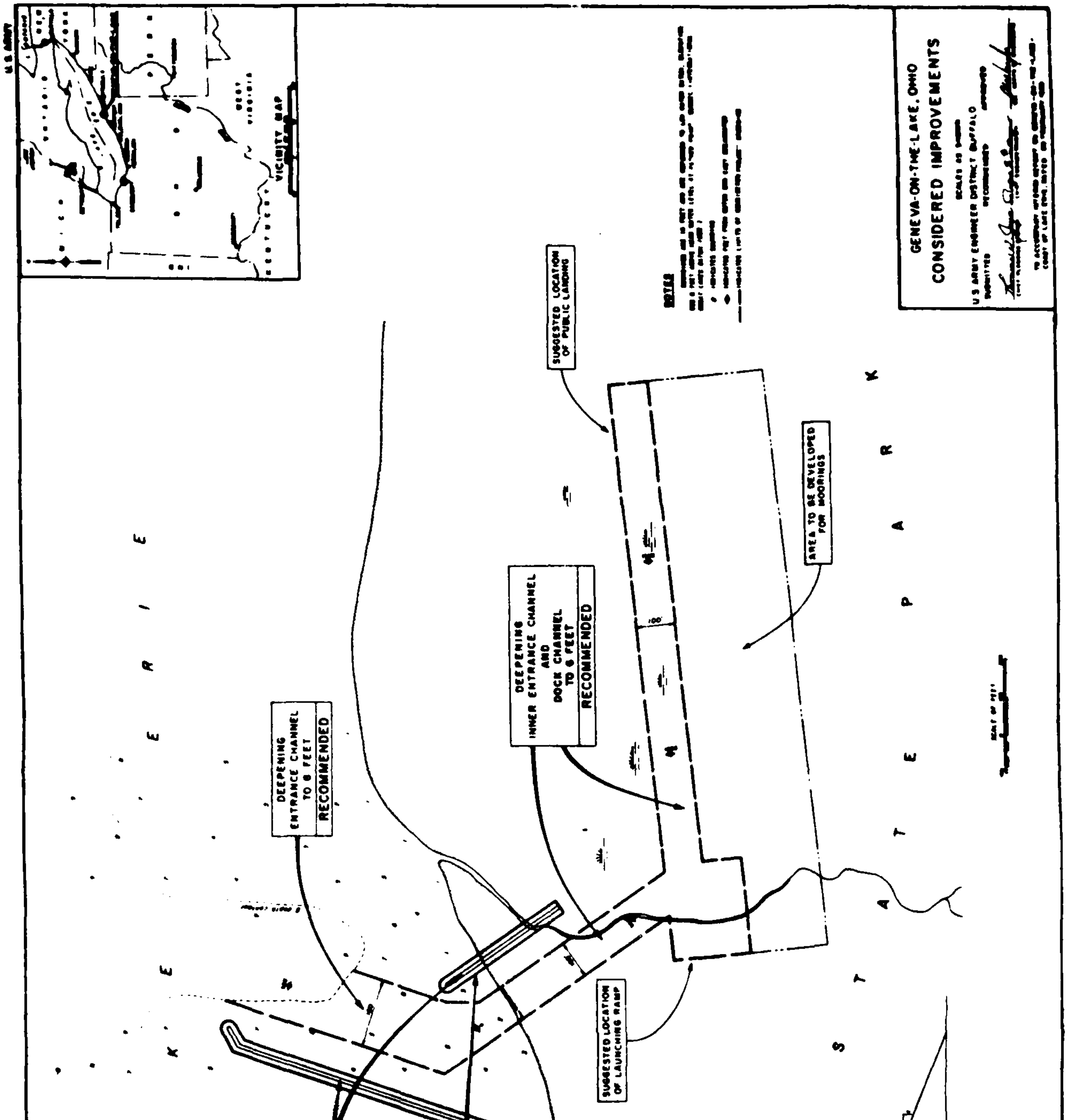
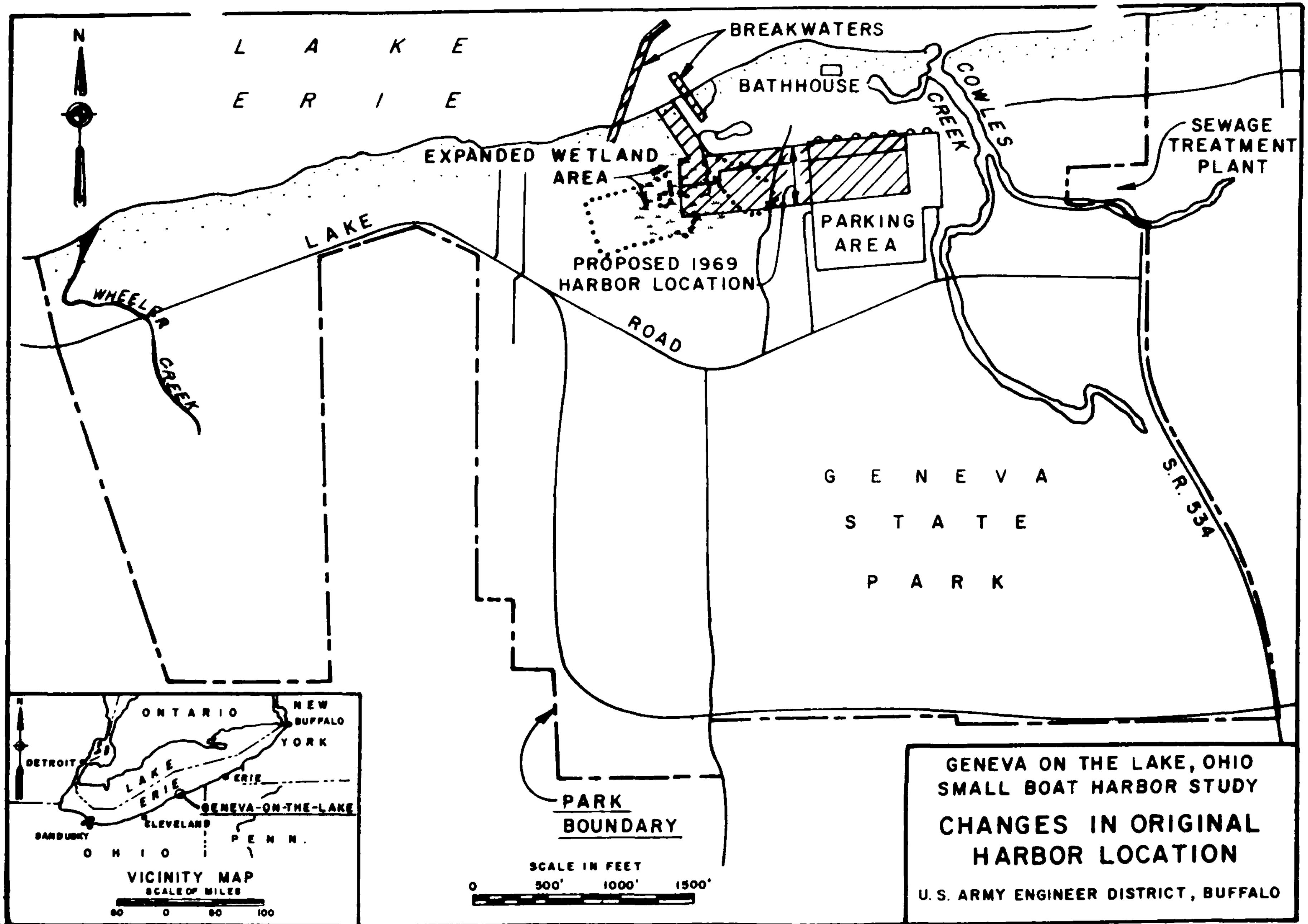


Plate 3

incl 2 to incl 1



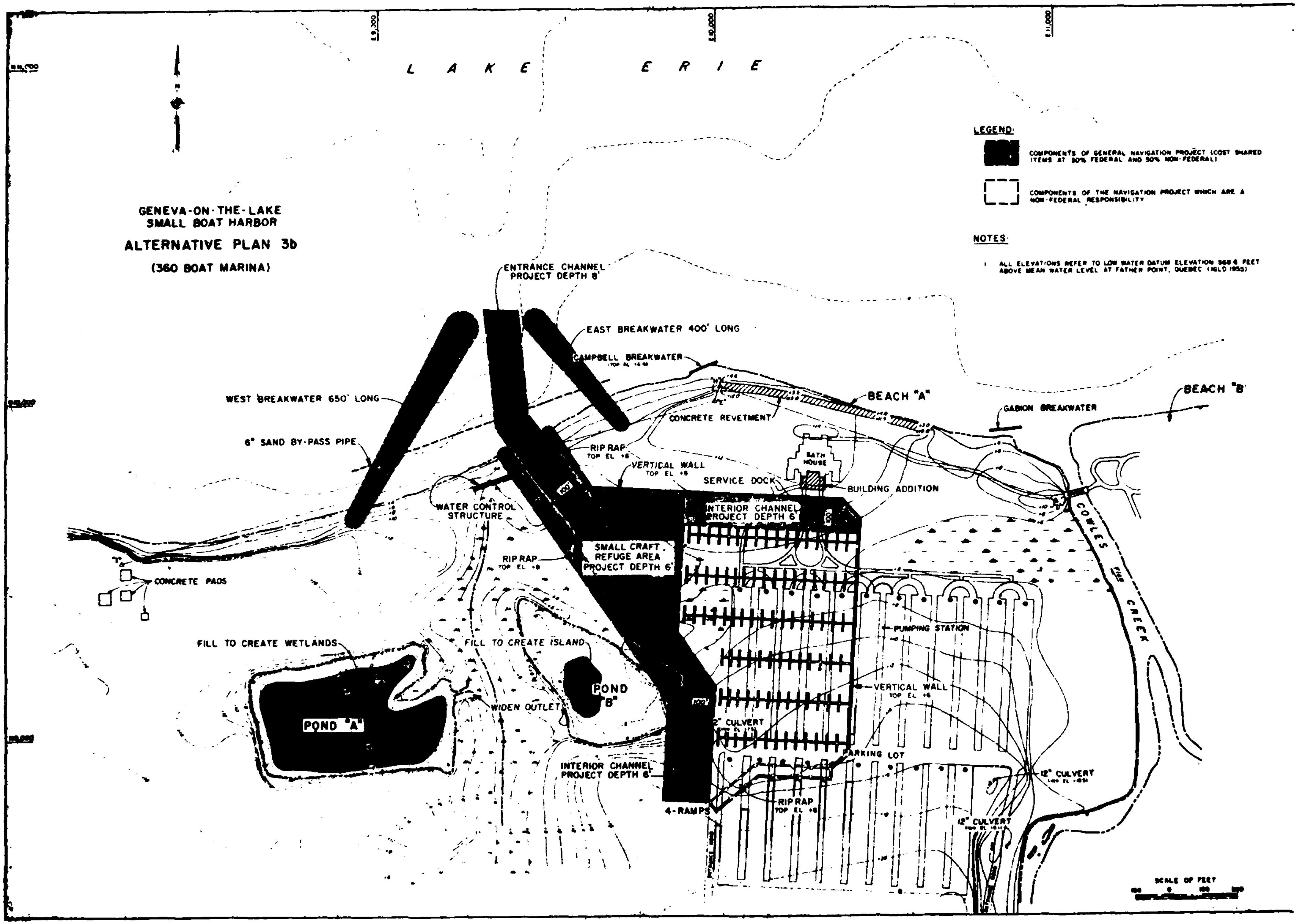
GENEVA ON THE LAKE, OHIO
SMALL BOAT HARBOR STUDY

CHANGES IN ORIGINAL HARBOR LOCATION

U.S. ARMY ENGINEER DISTRICT, BUFFALO

PLATE 4

GENEVA-ON-THE-LAKE
SMALL BOAT HARBOR
ALTERNATIVE PLAN 3b
(360 BOAT MARINA)



Incl 4 to Ane' 1

Table 1 - Expected Fleet Mix at Geneva State Park (400 Boat Marina)

Type of Craft	Length (feet)	Number of Boats
Outboards	16	29
Outboards	16-25	12
Inboards	16-25	53
Cruisers	16-25	27
Cruisers	26-39	185
Cruisers	40-64	31
Sailboats	16	5
Sailboats	16-25	5
Auxiliary Sailboats	16-25	6
Auxiliary Sailboats	26-39	37
Auxiliary Sailboats	40-64	6
Transient Boats	-	4
Total		400

Incl 5 to Incl 1

Table 2 - Average Fleet Draft

Type of Craft	Length (feet)	Average Draft (feet
Outboards	16	1.5
Outboards	16-25	1.5
Inboards	16-25	2.5
Cruisers	16-25	3.5
Cruisers	26-39	4.0
Cruisers	40-64	5.5
Sailboats	16	2.5
Sailboats	16-25	4.0
Auxiliary Sailboats	16-25	4.0
Auxiliary Sailboats	26-39	5.0
Auxiliary Sailboats	40-64	6.0

Incl 6 to Incl 1

APPENDIX G

REPORTS OF OTHERS

GENEVA-ON-THE-LAKE SMALL-BOAT HARBOR

FINAL REFORMULATION PHASE I GENERAL DESIGN MEMORANDUM

U. S. Army Engineer District, Buffalo
1776 Niagara Street
Buffalo, NY 14207

APPENDIX G

REPORTS OF OTHERS

Exhibit G-1	Cultural Resources Reconnaissance Survey, P/RA Research, Inc.
Exhibit G-2	U. S. Fish and Wildlife Service Four-Season Study, Geneva-on-the-Lake, Ashtabula County, Ohio
Exhibit G-3	U. S. Fish and Wildlife Service Coordination Act Report

Report On The Cultural Resources Reconnaissance Survey For Geneva-on-the Lake Small Boat Harbor Project

assembled by

Martin Murphy Annette Silver

U.S. ARMY CORPS OF ENGINEERS / BUFFALO DISTRICT
AR 2-80 FEB 80

P/RA RESEARCH INC.
P/RA Building, 1905 Hempstead Tpke, East Meadow, NY 11554 • 516-794-5552

EXHIBIT G-1

CULTURAL RESOURCES RECONNAISSANCE SURVEY

FOR GENEVA-ON-THE-LAKE SMALL BOAT HARBOR PROJECT

assembled by

Martin Murphy
Annette Silver

This report discusses work conducted under Contract Number DACW49-79-C-0088 for the U.S. Army Corps of Engineers/Buffalo District.

Prepared by
P/RA Research, Inc.
1905 Hempstead Turnpike
East Meadow, New York 11554
February, 1980

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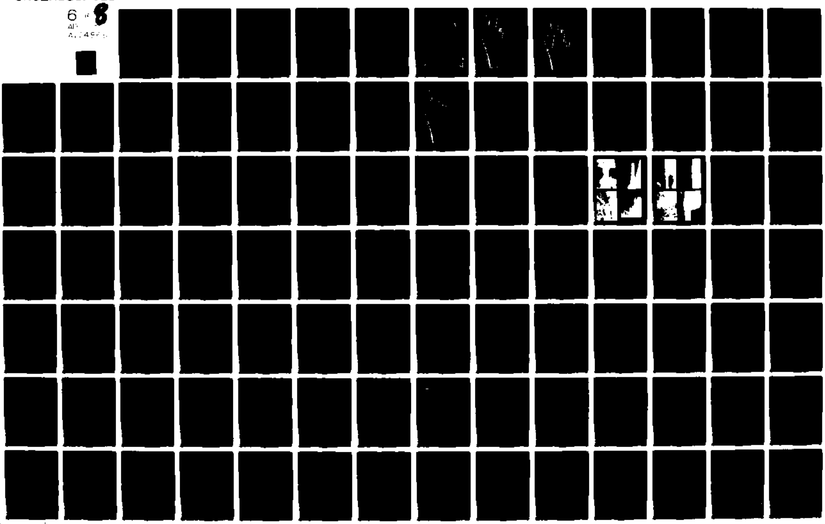

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ABSTRACT

A description of the methodology employed and the results of a cultural resources survey of the area designated for a proposed small boat basin in the Geneva State Park, Geneva-on-the-Lake, Ohio are presented in this report. This area was subjected to both a literature review and a thorough program of field testing. The results of the investigation indicate that the area in question does not contain significant cultural materials and that the proposed construction of the boat basin may proceed without further concern for its impact on cultural resources.

CHAPTER I

MANAGEMENT SUMMARY

This report presents the results of a cultural resources survey of the area of the proposed Geneva-on-the-Lake Small Boat Harbor, at Geneva State Park, Ohio. The report includes a description of the project location and environmental setting, a prehistoric overview, a historic overview, a description of field methodology and procedures, the results of subsurface testing, and an evaluation of the possible impact of the proposed construction project on cultural resources within the project area.

This study was performed by Martin F. Murphy and Annette Silver of P/RA Research, Inc., under Contract No. DACW49-79-C-0086, U.S. Army Corps of Engineers, Buffalo District. The Principal Investigator was Martin F. Murphy and the Associate Principal Investigator was Annette Silver. Research for the historical overview was done by William Gorry.

This cultural resources reconnaissance survey was performed in compliance with the National Historic Preservation Act of 1966 (P.L. 89-665), the National Environmental Policy Act of 1969 (P.L. 91-190), Executive Order 11593 (1971), the Archeological and Historic Preservation Act of 1974 (P.L. 93-291), and the Advisory Council Procedures for the Protection of Historic and Cultural Properties (36 CFR 800).

The report concludes from its findings that construction within the project area will not disturb or destroy any culturally significant artifacts.

CHAPTER II

PROJECT LOCATION AND DESCRIPTION

The Geneva-on-the-Lake project area is located in northeastern Ohio within Geneva State Park in the Town of Geneva-on-the-Lake, Astabula County (see Figure 1). The western boundary of the project area lies approximately 225 m west of the mouth of Skin Beach Creek; the eastern boundary lies 50 m east of the mouth of Cowles Creek. The northern boundary is along the shore of Lake Erie and the southern boundary extends as far south as the southern limits of the parking area (see Figure 2).

Environmental Setting

Prior to 1965 the project area was predominantly a marshland with two creeks, Cowles Creek and Skin Beach Creek, running northwards towards Lake Erie. Storms and high winds cause major shifts of the beach sands, damming the creek mouths and thus causing the land behind the dams to become increasingly saturated. At times of heavy rainfall there is sufficient current in the creeks to enable breaching of the sands, so that Cowles Creek and Skin Beach Creek can then drain into Lake Erie. This is a recurrent process.

In 1965 the marshland, Zone II, was filled in with earth dredged from the man-made pond (see Figure 3). The estimated depth of the fill is 1 m to 3 m (Burgett 1979, personal communication).

Presently, the land at the northern boundary of the project area is approximately 3 m above the present mean lake level of 175 m. South of these bluffs the terrain slopes gently until a point approximately 250 m away where the average elevation is no more than 1 m above the mean lake level.

The entire project area has been subjected to extensive natural and human caused disturbance. Natural disturbance is evidenced by extensive erosion, and human disturbance from both the destruction of the marshland in Zone II and the construction of access roads in Zones I and III (see Plates I through VII in Appendix B).

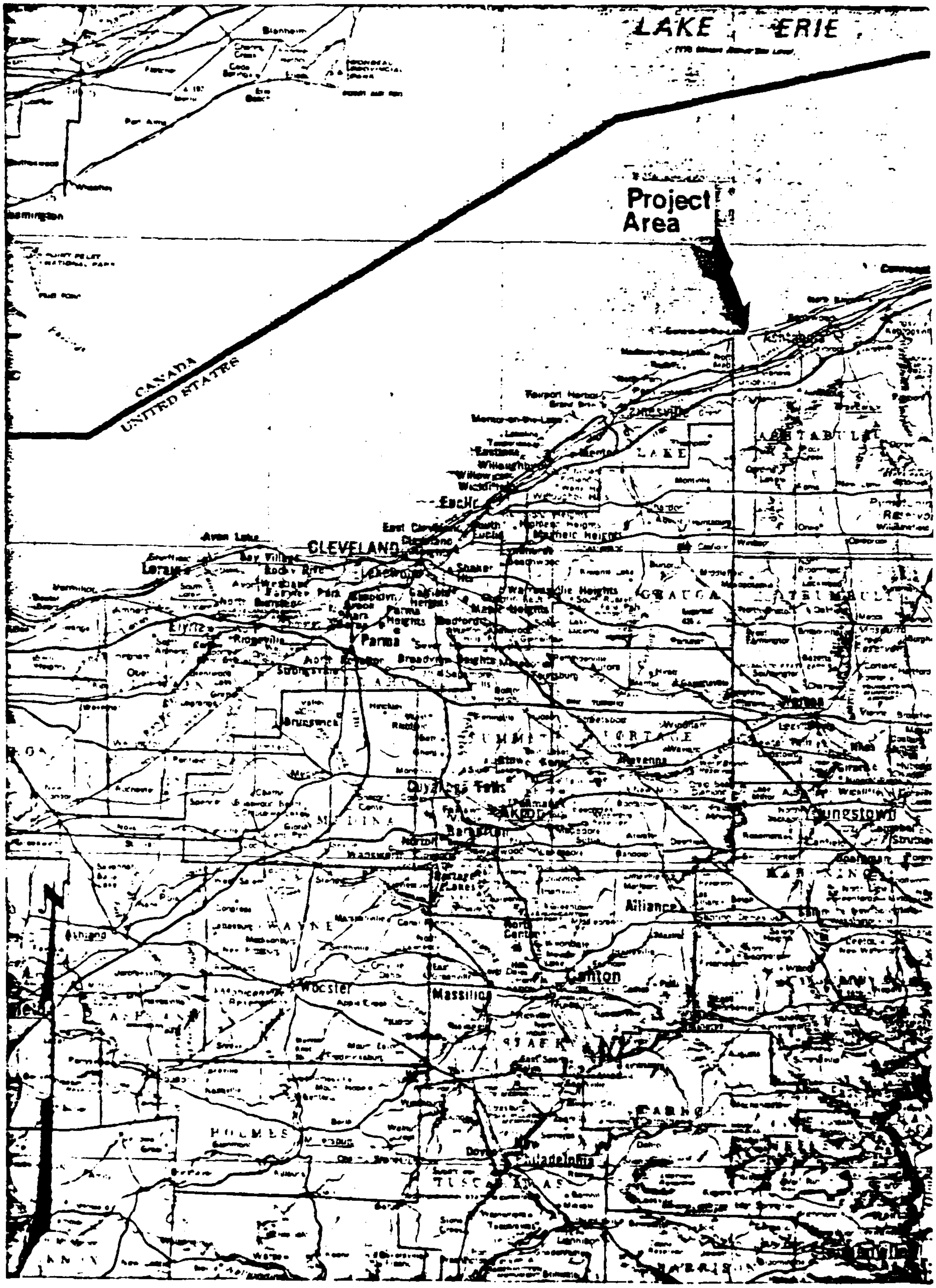

Figure 1. Project Area Location
(After Britannica Atlas 1970)

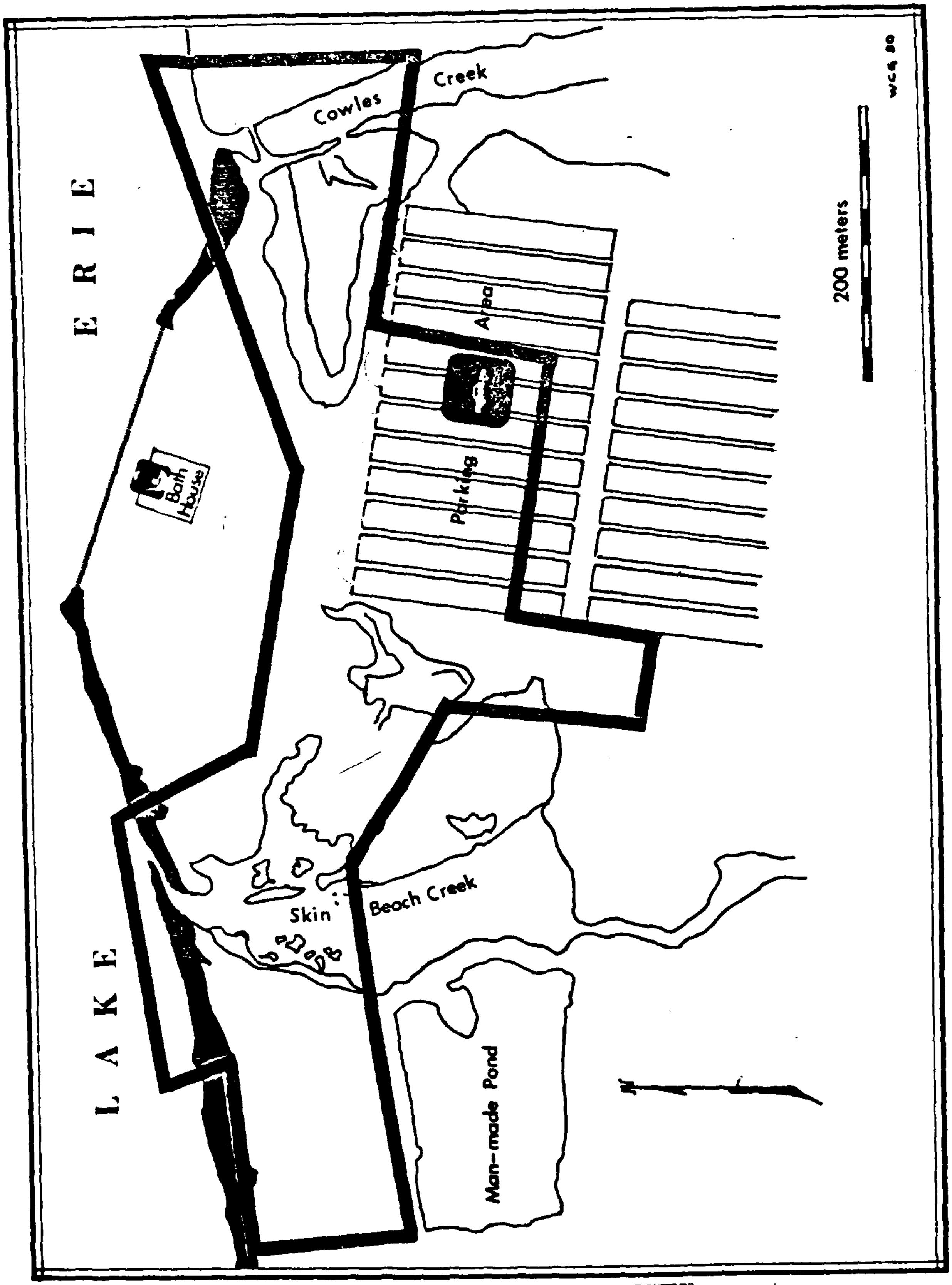

Figure 2. Project Area Base Map

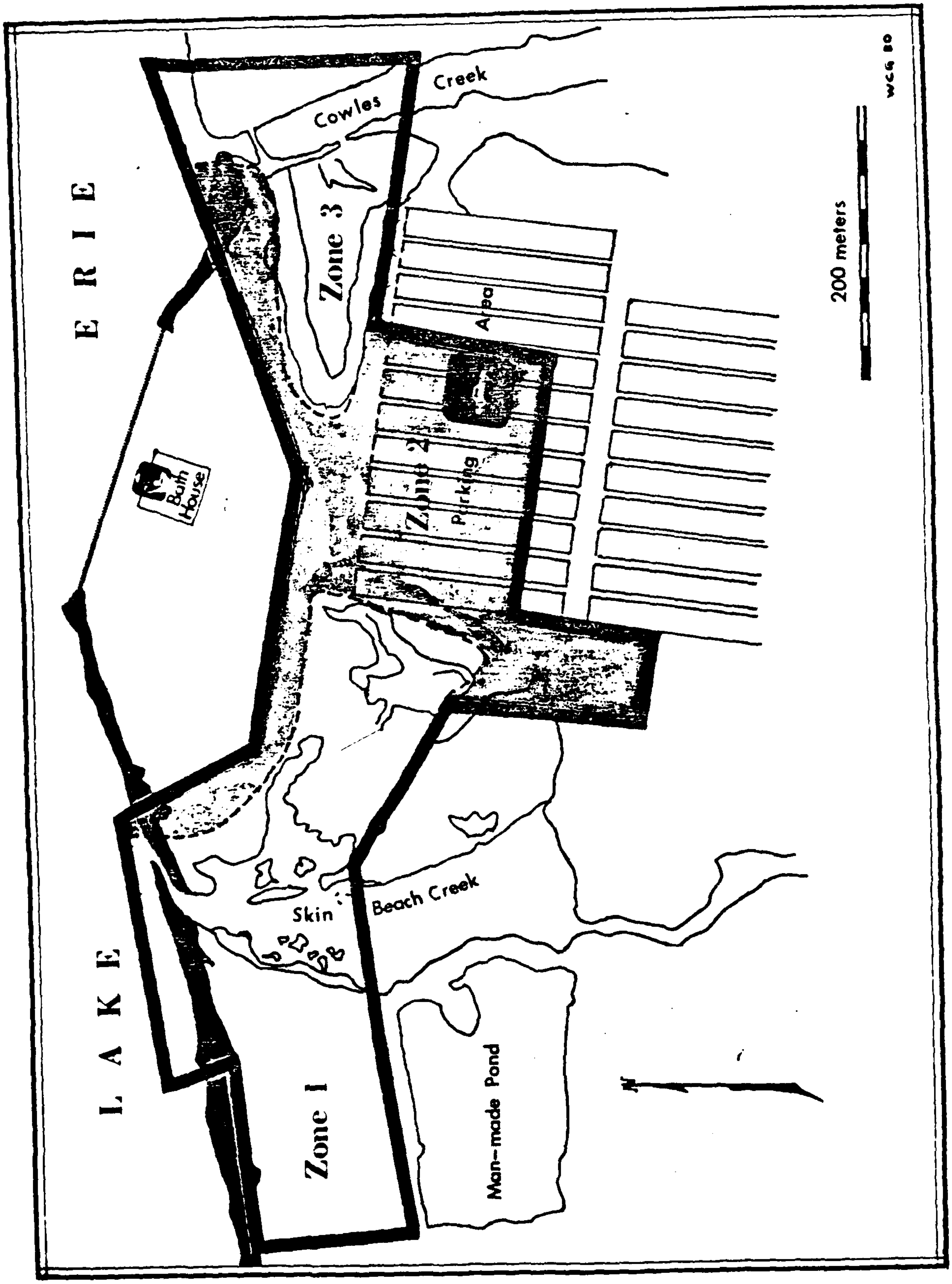

Figure 3. Project Area Base Map With Zones

Climate

The climate of the area can be classified as continental, with cold winters, warm summers, and an annual precipitation of approximately 89 cm. Lake Erie generally produces an ameliorating effect on the climate by moderating the extremes in temperature in winter and summer (Miller 1973). This effect of Lake Erie on the climate is evidenced by the fact that there are actually two distinct climatic regions in Ashtabula County, one along the shore of Lake Erie and the other region in the southern half of the county. In comparison to the southern climatic region, the shore areas experience less annual precipitation, lower summer temperatures, and higher winter temperatures.

Flora and Fauna

The project area is situated within the Carolinian biotic province. Highly diversified hardwood forests characterize this province with a preponderance of oak and chestnut trees (Dice 1943).

The prehistoric and early historic fauna of the area was represented by white tail deer, elk, red fox, beaver, mink, otter, grey squirrel, raccoon, badger, bobcat, and migrating waterfowl. As Brose et al. have stated for a nearby area, the fauna provided a "potential abundant and diffuse subsistence base for prehistoric hunters and gatherers" (Brose 1976:31).

Geologic History and Soils

Two physiographic provinces are present in Ashtabula County, the glaciated Appalachian Plateau Province and the Eastern Lake Section of the Central Lowlands Province, with the Portage Escarpment separating the two provinces. The project area lies within the lake plain of the Eastern Lake Section.

Of primary importance to archaeologists working along the present shores of Lake Erie is an understanding of the history of postglacial lakes in the area and the history of shoreline erosion.

After the retreat of the Wisconsin glacier the project area was underwater from approximately 8,000 to 14,000 years B.P. During this period the project area was inundated by Lakes Whittlesey, Warren, and Lundy, successively (Forsyth 1964).

In terms of recent geologic history the shoreline of Lake Erie has been subjected to tremendous erosion. As Hatcher (1945) states:

> The Lake Erie shoreline has always been, and still is, restless and unstable, and this characteristic, ..., has had a profound effect upon its history and its economy (Hatcher 1945:21).

The predominant soil in the project area is Conneaut silt loam, which is also the dominant soil of the Lake Erie Plain. Conneaut silt is a fine-silty, acid soil. Along Skin Beach Creek there is a band of Holly silt loam. This latter soil type is a fine-loamy, medium-acid alluvial soil. Claverack soils, sandy over loamy soils which are strongly acid, are found in the eastern third of the project area, and beach sand is present along the immediate shoreline (U.S. Department of Agriculture 1973).

CHAPTER III

PREHISTORIC OVERVIEW

The prehistory of the northeastern United States and of Ohio can best be understood within the context of three broad cultural stages: the Paleo-Indian Stage, the Archaic Stage, and the Woodland Stage. These stages will be discussed below.

Paleo-Indian Stage

Initial human settlement of the Northeast occurred as Paleo-Indians moved from the south and west as the retreat of the Wisconsin glacier opened up a new environment after 12,000 B.C. These Paleo-Indians followed migrating herds into Indiana, Ohio and continued eastward into Pennsylvania and New England. Later, they occupied the major river valleys, ranging hundreds of miles up and down the valleys as they followed migrating herds. Evidence found in known Paleo-Indian sites in the Northeast supports this settlement pattern of extensive movement within specific river valleys (Funk 1972, 1978).

These early inhabitants subsisted upon caribou, "moose-elk", and other large game (Funk 1972). One must also consider that they foraged as well, utilizing such edible plants and small animals as were supported by the environmental situation (Funk 1972, 1978).

The cultural assemblages associated with the early Paleo-Indians of the Northeast are comparable to the assemblages of the Clovis and Folsum big-game hunters of the Plains (Funk 1972, 1978). Paleo-Indian components *per se* have not been found in Ohio, nor are there any known Paleo-Indian campsites in the Lake Erie drainage basin. Prufer and Baby (1963) do describe surface sites dating from about 8,000 to 6,000 B.C. which are characterized by the presence of single, usually fragmentary, fluted projectile points of Clovis or Folsom type (Brose 1977a; Funk 1978).

Prufer and Baby (1963) recognize two major groups of Paleo-Indians in Ohio. They have designated the earlier group the Fluted Point Complex, and the later Paleo-Indian manifestation is termed the Plano Complex, due to the predominance of Plano-type points in the later assemblages. Materials associated with the later Plano Complex are noted to be less common in northeastern Ohio than in the northwestern section of the state. Unfluted points and a variety of other tools used by the Paleo-Indians are also found in Ohio (Prufer 1960b; Prufer and Baby 1963).

Prufer and Baby (1963) estimate that the Paleo-Indians entered southern Ohio as early as 15,000 B.C. and central Ohio by 12,500 B.C. These authors do not believe that the Paleo-Indians reached north-eastern Ohio until around 7,500-6,500 B.C. Distribution of both fluted point complexes is centered along the Scioto and Miami Rivers, along the diagonal southwest-northwest aligned hills representing the margins of past glacial tracts, and along the glacially deposited moraine belts. This distribution of fluted projectile points suggests to Prufer and Baby (1963) a general movement northward through Ohio from the southwest.

Much of Paleo-Indian artifacts identified in Ohio have been made from local lithic materials. However, lithics from New York, Kentucky, Indiana, West Virginia, and Pennsylvania are also represented (Prufer and Baby 1963:62-65). This adds support to Funk's (1972, 1978) theory of long-distance group movements in the Northeast during the Paleo-Indian period.

Paleo-Indian fluted points have been found in all of the north-eastern counties of Ohio. They were usually found near water courses or springs, on knolls, and on other slight elevations (Prufer 1960b, 1961).

As a result of his survey in the early 1960s, Prufer notes that five Paleo-Indian fluted points were found in Ashtabula County. There is no specific site location known within the county for four of these fluted points. The fifth was found in the Pymatuning Lake area, which is at the southeastern and thus the opposite end of the county from Geneva-on-the-Lake (Prufer 1960a, 1960b, 1961, 1962a, 1962b, 1963; Prufer and Chinn 1960; Prufer and Munro 1961).

Archaic Stage (6,000 B.C. - 800 B.C.)

Climatic changes, beginning around 6,000 B.C., permitted a north-ward advance of mixed coniferous-deciduous forests into the Northeast. With this environmental change from the tundra and spruce woodland there occurred a change in subsistence resource utilization from a heavy reliance upon large-game hunting to a reliance upon a more di-versified subsistence resource base. The subsistence activities of the Archaic peoples were the hunting of white-tailed deer, black bear, elk, small mammals, turtles, and birds; fishing; and the gathering of wild plant foods (Funk 1978).

The designation of Lake Forest Archaic has been applied to those Archaic peoples living in the Great Lakes drainage systems. These peoples are distinguished from other Northeast Archaic cultures by two aspects. One is the environmental situation. The Lake Forest cultures occupied a maple-beech-hemlock or a maple-basswood forest environment unlike those northern cultures occupying a boreal environ-ment and the cultures to the south who occupied a mixed hardwood forest environment. The other factor is that the Lake Forest Archaic communication network utilized the Great Lakes drainage rather than interior river drainages (Tuck 1978).

This distinctive cultural group was present in the Great Lakes drainage from about 3,000 B.C. to about 1,000 B.C. Evidence suggests that the Lake Forest Archaic was internally homogeneous and simultaneously was distinct from surrounding cultural traditions. The artifactual assemblages in the Great Lakes drainage area are so similar that Tuck (1978) proposes the possibility of a movement of people into the Lake Forest area, just prior to 3,000 B.C.

The picture for northern Ohio during the Archaic is not clear. There is a need for more evidence from habitation sites (Tuck 1978). Based upon present evidence there was a steady increase in size and density of the small mobile groups which were present in the beginning of the Archaic. Sites reflect gradual change to larger and slightly more sedentary populations who were exploiting a more restricted geographical area. By 2,000 B.C. the development of geographically specialized economic patterns with restricted local styles of tool types are evident. Brose feels this reflects "increasing local settlement-subsistence adaptations and the beginning of group territoriality" (Brose 1977a:12). This late period of the Archaic is also notable for the initial development of burial ceremonialism, as exemplified by the Adena Complex in southern Ohio, which became increasingly elaborate during the Woodland Stage. Numerous Archaic sites in Ashtabula County are listed in the Ohio Archaeological Inventory (Ohio Archaeological Council). However, none are located in Geneva Township.

Woodland Stage

Early Woodland (800 - 100 B.C.). The Early Woodland stage in the Northeast is marked primarily by the introduction of ceramics, with little drastic changes from Archaic subsistence and settlement patterns (Tuck 1978). In Ohio the Early Woodland is also identified by an increasing elaboration of mortuary ceremonialism and ceremonial exchange which began in the end of the Archaic period. In southern Ohio the Adena culture presented the most elaborate expression of mortuary ceremonialism for the Northeast during the Early Woodland stage. While a complete picture of Early Woodland subsistence patterns is lacking, the beginnings of horticulture in Ohio is indicated by the presence of early cultivation of curcurbita (squash and/or pumpkin), and the presence of Zea maiz in solely ceremonial contexts (Brose 1977a; Tuck 1978).

Very few Early Woodland sites have been located in northern Ohio (Bush 1978). A survey by Brose (1977a) in Conneaut Township in Ashtabula County identified one Early Woodland site, the Elmwood Road site. Analysis of collections with Early Woodland artifacts suggests to Brose that the Early Woodland in Ashtabula County was characterized by "small short-term campsites, utilized by limited groups for the seasonal exploitation of specific resources" (Brose 1977a:13).

Middle Woodland (c. 100 B.C. - 500 A.D.). The relatively stable Early Woodland cultures experienced an upsurge of cultural expression in the Middle Woodland stage. The best known cultural manifestation is the Hopewell. Hopewell or Hopewellian refers to a large number of archaeological assemblages having similar traits which range across the Northeast from New York State to Kansas City. Traits marking the Great Lakes-Riverine Hopewell are mound burials, earthworks, new ceramic styles, platform pipes, Panpipes, and well-crafted burial goods, present in contexts reflecting an increase in the elaboration of mortuary ceremonialism (Fitting 1978).

Middle Woodland sites reported for Ashtabula County are the Willie's Farm sites #1, #2, #3, the Robakewicz Mound site, the Art Knowles Farm site, the Anthony Farm site, Homer Rutter Site #1 and #2, East Fall site, and the Pittsburgh Dock Company site. None are located in Geneva Township (Brose 1977a; Ohio Archaeological Council).

Late Woodland (c. 500 A.D. - 1,600 A.D.). The Late Woodland is marked at the beginning by a breakdown of the exchange of exotic materials within the Hopewellian cultures, and by a sharp decrease in, if not absence of, the mortuary ceremonialism which was a notable characteristic of the Middle Woodland period. There is an increasing dependence upon maize horticulture and increases in population density and in village size during this period in Ohio (Brose 1977a). These later changes occurred so gradually that it is often difficult to distinguish Late Woodland materials, as they are termed in the literature, from Middle Woodland materials which are not associated with Hopewellian traits (Fitting 1978).

Changes in ceramic and architectural styles, the introduction of new crops, and the occasional presence of exotic materials in northern Ohio mark the influence of the Mississippian centers in the South and of the Fort Ancient culture of Southern Ohio. The most important Late Woodland culture in northeastern Ohio is the Whittlesey focus. This has been discussed by Greenman (1937), Fitting (1964) and in depth by Brose (1973, 1976a, 1976b, 1976c, 1977a, 1977b).

Evidence indicates that the Whittlesey focus was present in northeastern Ohio from around 1,000 A.D. Initially, there are indications of limited maize and squash horticulture associated with small settlements. Sites were located along the lake plain and alluvial bottomlands in the winter, spring, and summer, and on lakeside beach ridges cut by primary streams in the fall. Around 1,200 A.D. small village sites occupied from spring to fall are now found along secondary stream flood-plains and in elm-ash swamp forests. These village sites are associated with hunting camps and with small seasonal and specific-activity campsites on or nearby river bluffs (Brose 1977a).

After around 1400 A.D. there is a change in settlement pattern to a pattern of year-round occupation of large fortified villages located along bluffs, small winter hunting sites located at distant interfluvial plateaus, and spring and fall fishing and waterfowl hunting campsites, some of which are at lacustrine locations (Brose 1977a:16-26). Analyses of the floral, faunal, and paleopathology materials recovered at Conneaut Fort suggests that subsistence had shifted from mixed maize and hunting to maize dependency by the Late Woodland period (Brose et al., 1976). Details of the specific analyses are not provided by Brose et al., (1976). Such a shift in subsistence can be indicated by an increase in the percentages of maize cultigen remains and artifacts utilized in horticultural activities when accompanied by a decrease in the percentage of faunal and wild plant food remains. There are several paleopathological indications of increased maize diet in a skeletal population. An increase in dental caries over time in the skeletal population reflects a greater carbohydrate consumption and is associated with a maize diet (Klatsky and Klatell 1943). Resorptive vertebral pathology in skeletal remains has been associated by Buikstra (1976) with intensified horticultural activity in North American populations. Changes in the carbon-13 isotope ratios obtained from skeletal populations may also indicate the presence of maize as a significant subsistence resource (Van der Merwe 1978; Vogel and Van der Merwe 1977). Although the late and middle phases of the Whittlesey focus post-date 1400 A.D., no European goods have been found associated with any Whittlesey focus site (Brose 1971, 1973). Further discussion of Indian-European contact in northern Ohio is in the Historic Overview.

Many of the Late Woodland earthworks and fortifications in northern Ohio have been destroyed. One such earthwork has been located in southwestern Ashtabula County. This is the Windsor Mills Fort and Village site. Other Late Woodland sites reported for Ashtabula County are the Sauro Farm site, the Kantolo site, the East Fall site, Pittsburgh Dock Company site, Eastwall Knoll site, Yellow Birch site, Bennet Campsite, Anthony Ridge site, Anthony Farm site, and the Conneaut Fort site (Brose 1977a; Ohio Archeological Council). No Late Woodland sites are reported for Geneva Township and the project area.

CHAPTER IV

HISTORIC OVERVIEW

The usual pattern for European-Indian contact in inland Northeast was first the entry of European trade goods into the interior regions via indirect trade with intervening tribes. As the impact of the fur trade increased, European traders and explorers traveling inland provided the first direct contact. This second stage is usually represented by greater ratios of European goods at Indian sites and is documented in diaries and maps.

There is very little information about this early historic period and initial Indian-European contact in northern Ohio. The only Indian sites recorded for the early 1600s are a few Fort Ancient sites located in southern Ohio (Brose 1977a).

The first Indians noted in the histories of Ohio are the Erie. According to the Jesuit Relations of 1647-1648 (Hunter 1978:588) they were located generally far inland from Lake Erie. However, it is not clear whether or not the term "Erie" referred to a specific tribe or to a regional population (Hunter 1978).

Potter (1968) has suggested that Indians of the Whittelesey focus of the late prehistoric period may have been those Erie Indians believed to have been destroyed by Iroquois entering northeastern Ohio from New York State around 1654. However, White (1978) notes that this identification of Erie cultures in northeastern Ohio is based upon assumptions about Erie locations which cannot be firmly supported at present.

Present evidence suggests that at the beginning of the historic period Ohio was no longer occupied by sedentary groups, but was utilized only as a hunting ground (Hunter 1978). Subsequently, Iroquois Indian groups moved into Ohio and the Ohio River Valley as a result of conflicts over the fur trade and increasing demands for furs which led to Iroquois movements westward.

During the American colonial period the present state of Ohio was part of the land grant awarded to Connecticut by Charles II in 1662. Prior to 1802 the area now defined as the state of Ohio was referred to by many names, New Connecticut, The Connecticut Western Reserve, The Connecticut Reserve, "but it was soon designated in legal and historical records as The Western Reserve of Connecticut, and in Ohio simply as The Western Reserve" (Hatcher 1966:11).

The property of the Western Reserve (3,000,000 acres) was sold by the State of Connecticut to the Connecticut Land Company in 1795 for a sum of $1,200,000. The company, comprised of shareholders, sent representatives to map and settle the area. On July 4,

1796, this expedition arrived in Conneaut, Ashtabula County under the leadership of Moses Cleaveland. This expedition constituted the first major mapping party of Euro-americans in the Western Reserve.

The land purchased by the Connecticut Land Company was divided according to the relative shares held by the stockholders. This parcel sale of lands resulted in irregular settlement patterns and slow development of the Reserve for the first 30 years, 1800-1830.

During the first 30 years of settlement of Ashtabula County, life was extremely difficult for the emigrants from Connecticut. Although conflict with the Indians of the area was minimal, the climate and the lack of food and supplies took its toll on these pioneers (Howells 1927).

With the opening of the Erie Canal, Ashtabula County experienced a flood of immigration of German, Irish, Scottish, English, Bohemian, and Scandanavian peoples. These immigrants provided the labor and, in some instances, the capital which aided Ashtabula County in its development into a farming and light manufacturing area (Hatcher 1976).

This dual economic base of agriculture and light manufacturing is still evidenced in contemporary Ashtabula County, and particularly in the town of Geneva. Geneva-on-the-Lake, the closest population center to the project area, has been a summer tourist area since the beginning of the twentieth century; with little or no emphasis on agriculture and manufacturing.

Geneva, Ohio and the project area lie within the tract of the Western Reserve which was initially owned by Caleb Atwater, Gideon Granger, and William Hart. The first Euro-american settler in this general area was Theobalt Bartholomew who established a settlement in 1805 near the west bank of Cowles Creek and south of the project area (History of Ashtabula County, Ohio 1878).

Although there is no specific reference to the project area in the published materials cited or consulted, discussions with local informants demonstrated that the primary use of the area during the late 1800s up until 1965 was for hunting, trapping, and fishing.

Today the project area is used by both local residents and visitors from nearby urban areas as a recreational site with facilities for swimming, fishing, and picnicking.

CHAPTER V

FIELD INVESTIGATION

The project area as defined by the Scope of Work (Appendix A) is an irregularly shaped area of approximately 16 hectares which may be affected by the construction of a small boat harbor. This area was subjected to an intensive survey which consisted of a pedestrian survey and subsurface testing. The investigative techniques employed in the survey are described below.

Pedestrian Survey

No surface scatter cultural materials or other evidence of prehistoric or pre-twentieth century activity, were noted through the pedestrian survey. The pedestrian survey demonstrated that the entire project area has been subjected to disturbance and erosion, although Zones I and III (see Figure 3) were less disturbed than Zone II.

Zone I, west of Skin Beach Creek, is a heavily wooded area comprised of thorn apple and red-stemmed dogwood trees, and wild grapes in the interior of the zone; and sumac, raspberry, and blackberry bushes on the periphery. The presence of a now-impassable gravel bed road, overgrown with vegetation, indicated that a considerable amount of land disturbance had occurred in this zone.

Zone II, east of Skin Beach Creek and west of Cowles Creek, is a heavily disturbed area. The pedestrian survey demonstrated that the entire area in Zone II was modified by man. In consultation with pre-1965 maps at the Ashtabula County Engineers Office and previously discussed personal communication with informants, it was determined that Zone II was a swamp prior to 1965 when this was area filled in with soil excavated from the man-made pond (see Plates VI and VII).

Zone III, east of Cowles Creek, is the westernmost section of the present day Chestnut Grove Picnic Area. This area also showed significant signs of land disturbance as demonstrated by the presence of a gravel access road which is not shown on the project map. Dramatic evidence of erosion was noted on the north, or shoreline, extreme of this zone (Plate III). The remainder of this zone also demonstrated a significant degree of erosion.

Subsurface Testing

Subsurface testing consisted of the excavation of a series of .5 m wide shovel test pits which were dug into sterile subsoil to depths not exceeding 100 cm. All soil removed from these test pits was screened through 1/4" wire mesh to ensure the recovery of all cultural materials. Profiles were recorded for all test pits, with soil descriptions and cultural materials present noted (Appendix C). For the entire project area, a total of 26 test pits was excavated. No prehistoric and no significant historic materials were recovered.

The background literature search failed to document any evidence of prehistoric or pre-1900 historic sites in the area. Based on conversations with the Park Manager (Burgett, 1979) it was reported that prehistoric materials had been located in Zones I and III by local residents and an amateur archaeologist. It was also noted that the presence of natural features such as creeks, a swamp, and the lake may have been of significant economic use to both prehistoric and historic populations. In consideration of these two points, it was decided to place shovel test pits every 50 meters in Zones I and III (Figure 4).

Originally 11 shovel test pits were to be placed in Zone I. (Profiles in Appendix C). The only test pit that produced cultural materials was Pit D5. The first 22 cm of this pit produced various mid-twentieth century refuse; from 23 cm to 100 cm of this pit produced various sterile. The cultural materials recovered consisted of broken soft drink bottles, broken porcelain, plumbing, and electrical fixtures, decomposing metal cans, and kitchenware sherds.

Three additional test pits (D5a, D5b, D5c) were placed in the dump area to determine both the lateral dimensions and depth of this dump. As in Pit D5, contemporary refuse of the type described above was recovered to a depth not exceeding 25 cm. This contemporary dumping ground appears to extend east to the bank of the creek, approximately 7 m, and to a maximum radius of 12 m.

In conversations with the Park Manager (Burgett, 1979), it was noted that this western bank of Skin Beach Creek was an illegal dumping area used in the 1950s and early 1960s.

Also in conversation with the Park Manager, it was noted that within Zone I there was a foundation of an early twentieth century cabin. Due to the extreme impassability caused by undergrowth in the area, it was impossible to locate this foundation. However, an area approximately 8 m by 9 m in direct line between Pit B5 and Pit C5 (its western most boundary is 14 m from Pit C5) reveals evidence of a second contemporary dumping ground. Surface collection resulted in an inventory of mid-twentieth century wine and liquor bottles, and numerous remnants of plastic and metal toys. It is assumed that this second dumping ground is tangential to the foundation of the cabin.

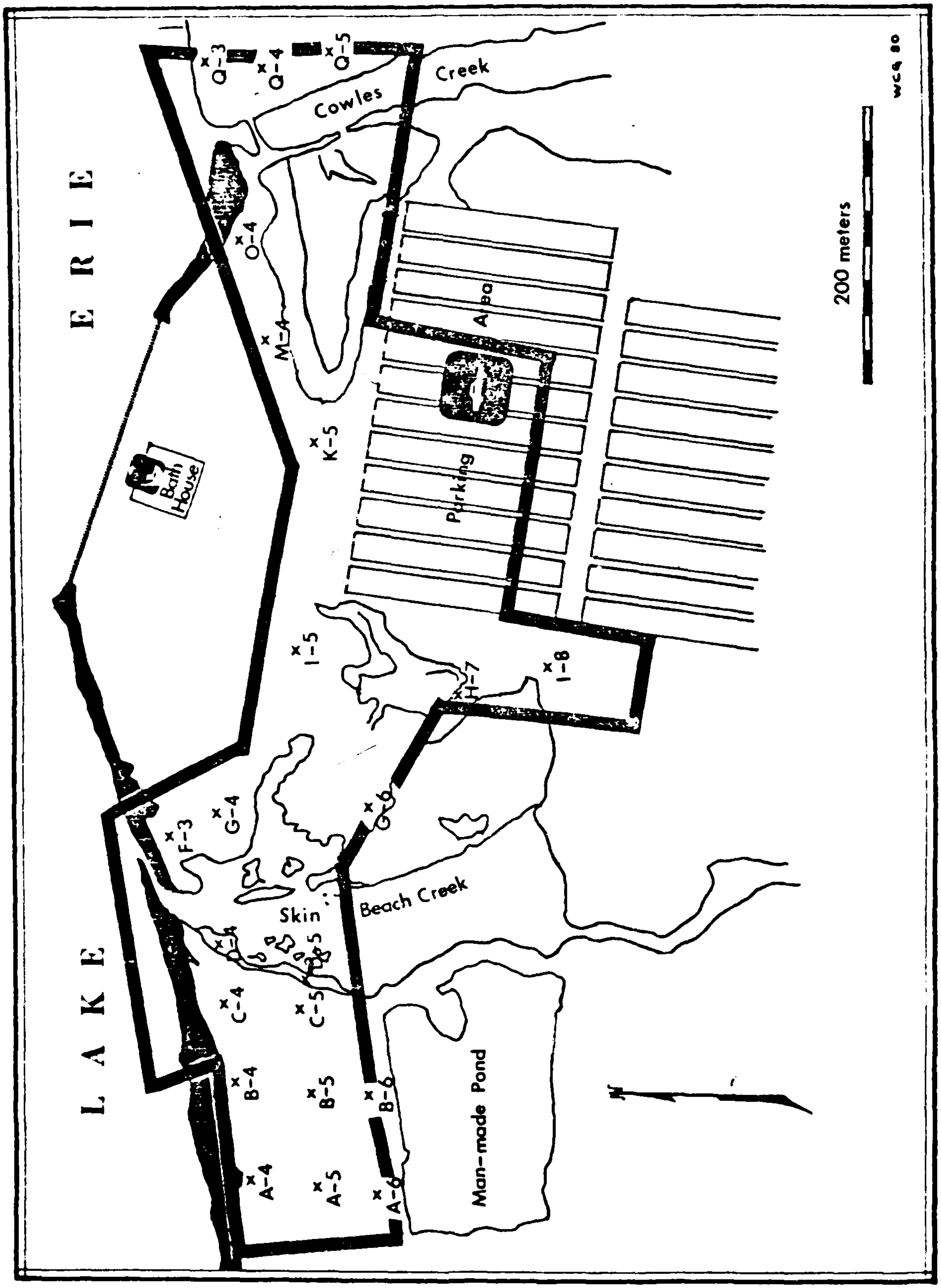

Figure 4. Project Area Base Map With Test Pit Locations

A check of pre- and post-1965 topographic maps from the United States Geological Survey (Figures 5 and 6) does not reveal major changes in contour (more than 3 m) in Zone II. However, personal communication with Doug Burgett, Park Manager, indicates that this area was subject to landfill operations in 1965. Although the extent or depth of this fill cannot be precisely noted the minimum depth of this fill is more than 1 m (Burgett, 1979).

Because it is impossible to reach the original soil using the shovel testing methodology mentioned above, under normal circumstances the entire area comprising Zone II would not be subjected to subsurface testing. However, because it had been reported that prehistoric materials were recovered from the area which is now Pond A and that this soil was used as fill for Zone II (Burgett, 1979), it was decided to test Zone II placing shovel test pits at 100 m intervals.

It was recognized that any cultural materials which were recovered in this zone would be out of sequence, and therefore prohibit a complete analysis. However, if significant cultural materials were located, they could provide some evidence for developing hypotheses concerning the prehistoric and historic use of the general project area.

A total of nine shovel test pits were excavated in Zone II according to the methodology previously stated. All of Zone II, except the parking area, was subjected to this 100 m interval subsurface testing. No prehistoric or historic cultural materials were recovered.

It was reported that "about 10 years ago" an amateur archaeologist recovered prehistoric materials in Zone III (Burgett and Lafferty 1979). Based on this information and the natural features of the area (swamp, creek, and lake, all in juxtaposition) Zone III would be classified as a area having a high potential for prehistoric use and occupation. However, because of the evidence of land disturbance and erosion discussed in the Pedestrian Survey section of this report, the potential of recovering cultural materials was greatly reduced.

It was decided to place shovel test pits every 50 m, as in Zone I. A total of three test pits were excavated and no prehistoric or historic cultural materials were recovered.

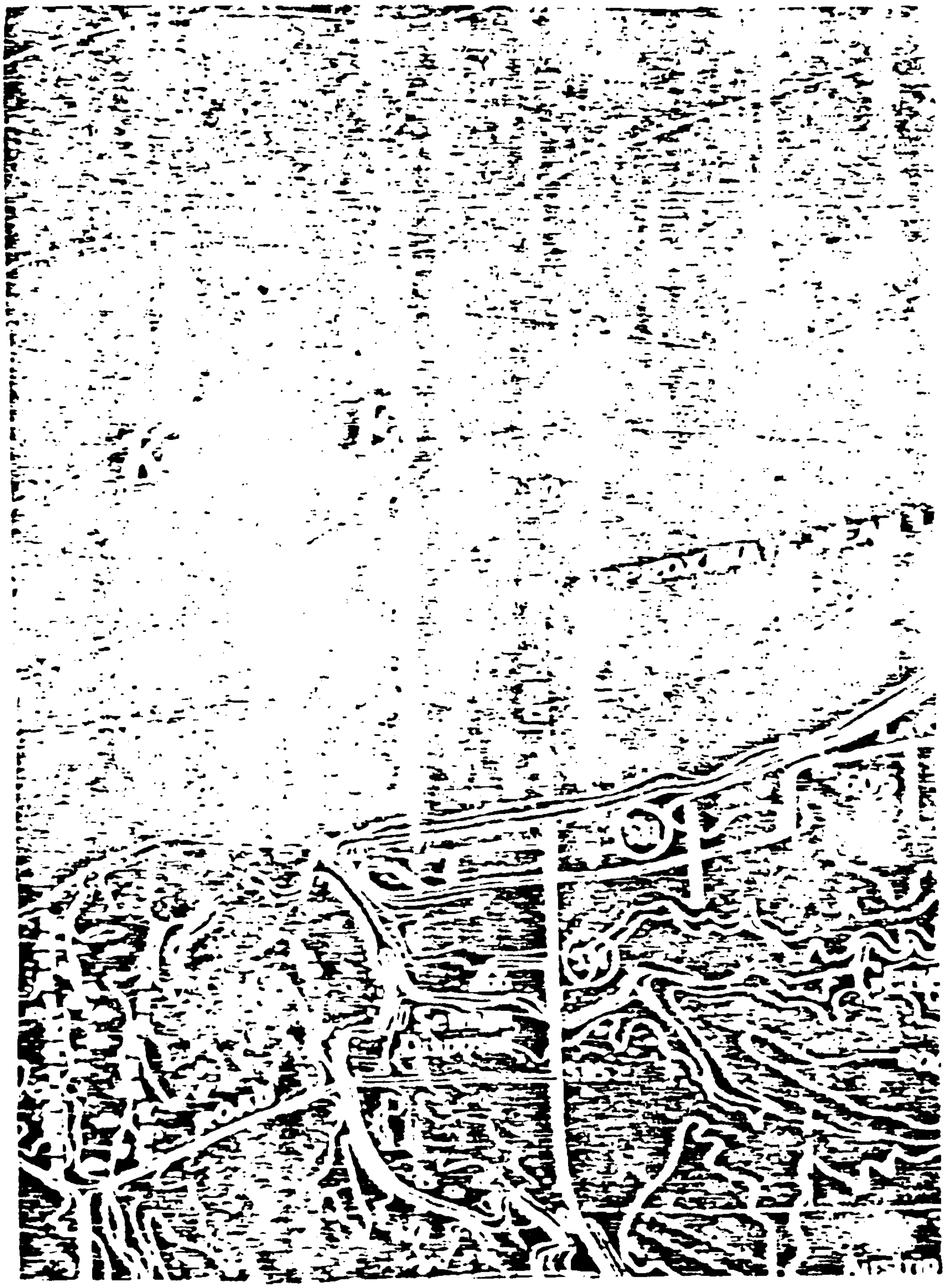

Figure 5. 1958 Map of Project Area (U.S. Department of the Interior Geological Survey 1960)

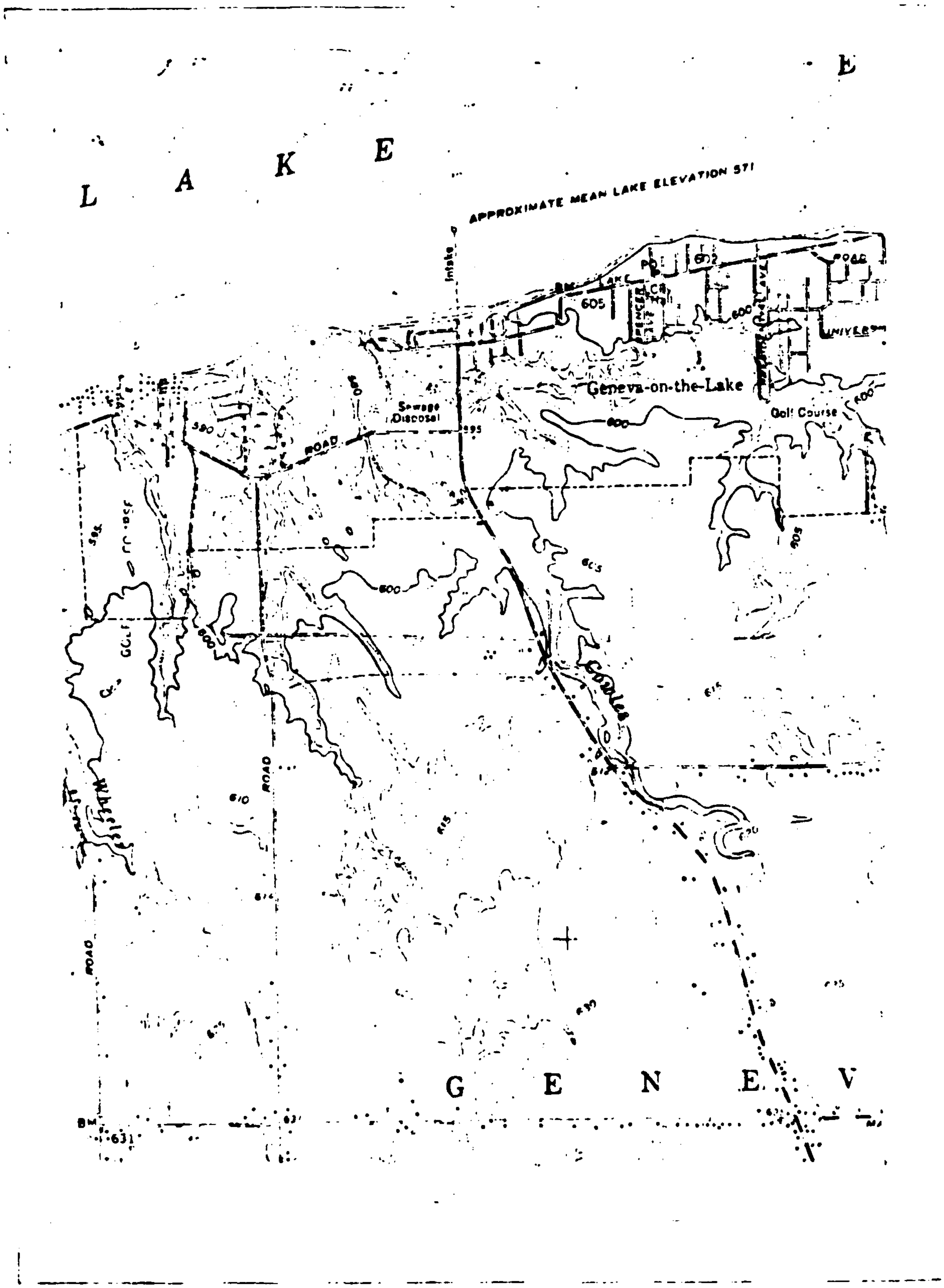

Figure 6. 1970 Map of Project Area (U.S. Geological Survey.)

CHAPTER VI

SUMMARY AND RECOMMENDATIONS

The background and literature search and the field investigation of the cultural resources survey described in this report failed to identify the presence of either prehistoric or early historic cultural resources within the project area. The research findings of Brose and Lee (1975) from an archaeological investigation at the nearby Perry Nuclear Power Plant are quite similar to those presented in the present report. Based on the natural features of the area (prehistoric and early historic faunal and floral associations, and the presence of the lake, creeks, and marshlands in the project area, one would expect the area in question to have been used and/or occupied by prehistoric peoples. However, the extent of erosion and modern disturbance drastically minimize the probability of locating evidence of prehistoric activity in the area.

It is the conclusion of the researchers, based on the background research and field investigation findings, that it is not necessary to recommend any further investigation of the area. Consequently, it is recommended that the construction of the small boat harbor proceed without further concern for the possible disturbance or destruction of significant cultural resources.

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Ohio Archaeological Council
Ohio Historic Preservation Office, Ohio Historical Center, Columbus, Ohio 43211.

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Prufer, Olaf H.
1960a *Survey of Ohio Fluted Points,* Cleveland No 1. Museum of Natural History, Cleveland.

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1961 *Survey of Ohio Fluted Points,* No. 4. Museum of Natural History, Cleveland.

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White, Marian E.
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B. Personal Contacts

Bush, David

Associate Curator of Archeology. Cleveland Museum of Natural History, University Circle, Cleveland, Ohio.

Burgett, Duane

Inspector. Ashtabula County Engineers Office, Jefferson, Ohio.

Burgett, Doug

Park Manager. Geneva State Park, Geneva, Ohio.

Johannesen, Eric

Western Reserve Historical Society, 10825 East Boulevard, Cleveland, Ohio.

Lafferty, Lloyd

Assistant Park Manager. Geneva State Park, Geneva, Ohio.

Ruffini, Franco

State Registery Program Manager, Ohio Historical Society, Interstate 71 and 17th Avenue, Columbus, Ohio

APPENDIX A

Scope of Work

CULTURAL RESOURCES RECONNAISSANCE SURVEY
FOR GENEVA-ON-THE-LAKE SMALL-BOAT HARBOR PROJECT

GENERAL REQUIREMENTS

1. The purpose of this contract is to locate and assess known and unknown cultural resources sites and objects within the environmental impact area of the proposed Geneva-on-the-Lake Small-Boat Harbor Project as shown on Map 1. This action is being taken pursuant to the National Historic Preservation Act of 1966 (P.L. 89-665); the National Environment Policy Act of 1969 (P.L. 91-190); Executive Order 11593, "Protection and Enhancement of the Cultural Environment," 13 May 1971 (36 F.R. 8921); Preservation of Historic and Archeological Data, 1974 (P.L. 93-291); the Advisory Council on Historic Preservation, "Procedures for the Protection of Historic and Cultural Properties" (36 CFR Part 800); and 33 CFR Part 305, Identification and Administration of Cultural Resources.

2. This cultural resource survey report will serve several functions. The report will be used as a planning tool which will aid the Corps in meeting its obligations to preserve and protect our cultural heritage. It shall also be a comprehensive, scholarly document that not only fulfills mandated legal requirements but also serves as a scientific reference for future professional studies. As such, the report's content must not only be descriptive but also analytic in nature (P.L. 93-291, proposed rule-making 36 CFR Part 66).

3. The Contractor shall perform this work in a manner which will insure the greatest contribution to the history and prehistory of Ohio.

4. The Contractor shall conduct this work in close cooperation with the State Historic Preservation Officer. Evidence of such cooperation will be documented in the report.

5. The extent and character of the work to be accomplished by the Contractor shall be subject to the general supervision, direction, control, and approval of the Contracting Officer.

SPECIFIC REQUIREMENTS

6. The Contractor shall conduct a cultural resources reconnaissance survey as defined in 33 CFR Part 305.13e. This survey shall include but not be limited to: an intensive on the ground survey supplemented by shovel testing where necessary; and a literature search and records review in order to locate and assess all cultural resources sites and objects within the environmental impact area of the study.

7. The Contractor shall keep standard field records which may be reviewed by the Contracting Officer. These records shall include but not be limited to field notebooks, site survey forms, field maps, photographs, and stratigraphic profiles.

8. The Contractor shall obtain permission from the appropriate landowners to enter their property for the purposes of conducting the field survey and testing. The Contracting Officer will provide a letter of introduction to the Contractor to aid in obtaining access to this private property.

9. The field survey shall be closely coordinated with the Contracting Officer. The Contracting Officer reserves the right to have a representative of the Buffalo District present during the field survey.

REPORT REQUIREMENTS

10. The Contractor shall prepare a report detailing the work done, study rationale, survey results, recommendations for additional work, and testing on sites which appear to be potentially eligible for inclusion on the National Register of Historic Places. The report shall include but not be limited to the following sections: an abstract, an introduction, a brief section placing the project area in a regional context, a section on the methodology employed, a brief evaluation of previous work done in the area, an evaluative inventory of cultural resources in the project area, recommendations for testing of sites which appear in general terms to be potentially eligible for inclusion on the National Register of Historic Places, a concise definitive summary, and references. The above items may not necessarily be discrete units but shall be readily discernible to the reader.

11. The abstract shall be a synopsis of the report where the reader may find the general conclusions and recommendations resulting from the cultural resource reconnaissance survey.

12. The introduction shall include but is not limited to the following: the purpose of the survey, delineation of the study boundaries, and a general statement on the nature of the study conducted.

13. The regional setting including environmental factors affecting the location of cultural resources and the known culture history should be briefly summarized.

14. The methodology used for data collection and analysis shall be described in sufficient detail for a reviewer to understand what was done and why. This shall include but not be limited to a discussion

of surveying and sampling procedures, the types of data collected, artifact retrieval procedures, recording techniques, classifactory schemes, methods of chronological determination, and any special analytical methods and techniques used. Maps which show the area surveyed, locations of any test pits, and location of cultural resources recorded shall be included.

15. Typical soil profiles and drawings and/or clear photographs of any anomalies that are discussed in the report shall be included. Examples of standard forms used in recording and/or analyzing data shall be included.

16. There shall a brief summary of the study findings and recommendations. It should be clear from this exactly what, if any, additional studies are recommended prior to construction of the proposed project. If there are no sites in the project area and no additional work is deemed necessary, a statement to this effect shall be included in the summary.

17. All references cited and/or utilized shall be listed in American Anthropoligical Association format. Contacts with other individuals shall also be cited.

18. Information shall be presented in textual, tabular, and graphic forms, whichever are most appropriate, effective, and advantageous to communicate necessary information. The Contractor shall give every consideration to the use of nontextual forms of presentation, particularly profile (cross section) drawings in combination with maps, to maximize the quantity and quality of information presented.

19. If the report is authored by someone other than the principal investigator, the principal investigator shall prepare the foreward describing the overall research context of the report, the significance of the work, and any other related background circumstances relating to the manner in which the work was undertaken.

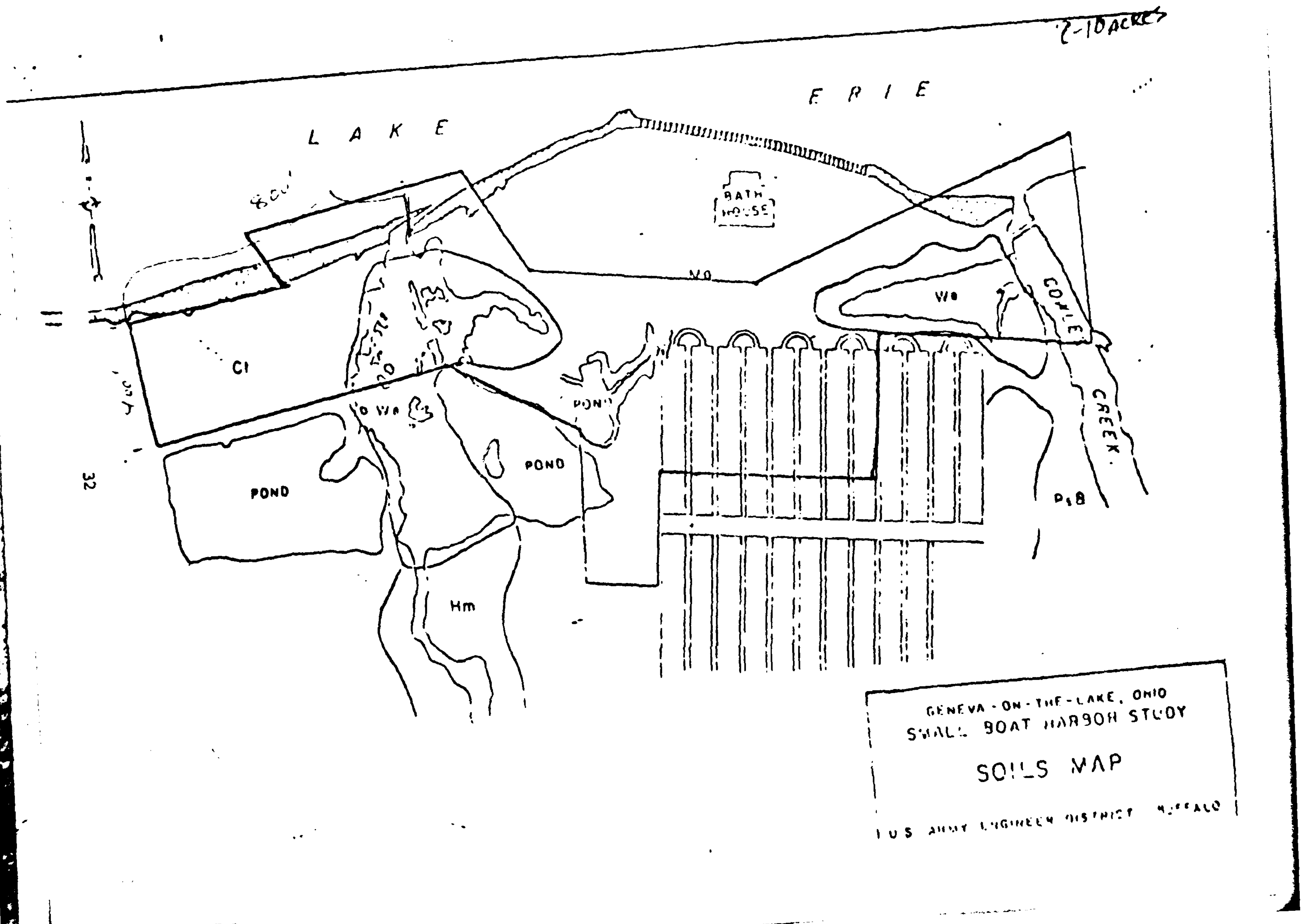
20. The following items shall be included as appendices to the report: the vitae of the principal investigator and any consulting professionals, this Scope of Work, the research design submitted as a result of this procurement action, any letters of comment on the draft report from other agencies forwarded by the Contracting Officer, and the comments on the draft report offered by the Contracting Officer.

SUBMITTALS

21. The Contractor shall submit six copies of a double-spaced draft report within 60 calendar days after receipt of the Notice to

Proceed. The Contracting Officer will provide the Contractor with comments on the draft report within 30 days after receipt of the draft. If for any reason this review period is not sufficient the Contracting Officer shall so notify the Contractor. The Contractor shall submit one original and 10 copies, single-spaced, of the final report, including appropriate revisions in response to the Contracting Officer's comments within 15 days of receipt of those comments.

22. Neither the Contractor nor his representatives shall release any sketch, photograph, report, or other material of any nature obtained or prepared under the contract without specific written approval of the Contracting Officer prior to the time of final acceptance of the report by the Government.



2-10 ACRES
LAKE ERIE
BATH HOUSE
COWLE CREEK
Wo
Wa
Cl
PbB
POND
POND
POND
Hm
GENEVA-ON-THE-LAKE, OHIO
SMALL BOAT HARBOR STUDY
SOILS MAP
U.S. ARMY ENGINEER DISTRICT, BUFFALO

APPENDIX B

PLATES

Plate 1. Mouth of Cowles Creek.

Plate II. Mouth of Skin Beach Creek.

Plate III. Bluff Erosion in Zone III Facing Bathhouse Along Lake Erie Shoreline.

Plate IV. Looking West Along Zone I Shoreline From Mouth of Skin Beach Creek.

Plate V. Underbrush in Zone I.

Plate VI. Man-made Pond From East Shoreline.

Plate VII. From South of Man-made Pond Looking Toward Zone I.

Plate VIII. View of Zone II from Northwest Corner of Parking Area.

APPENDIX C

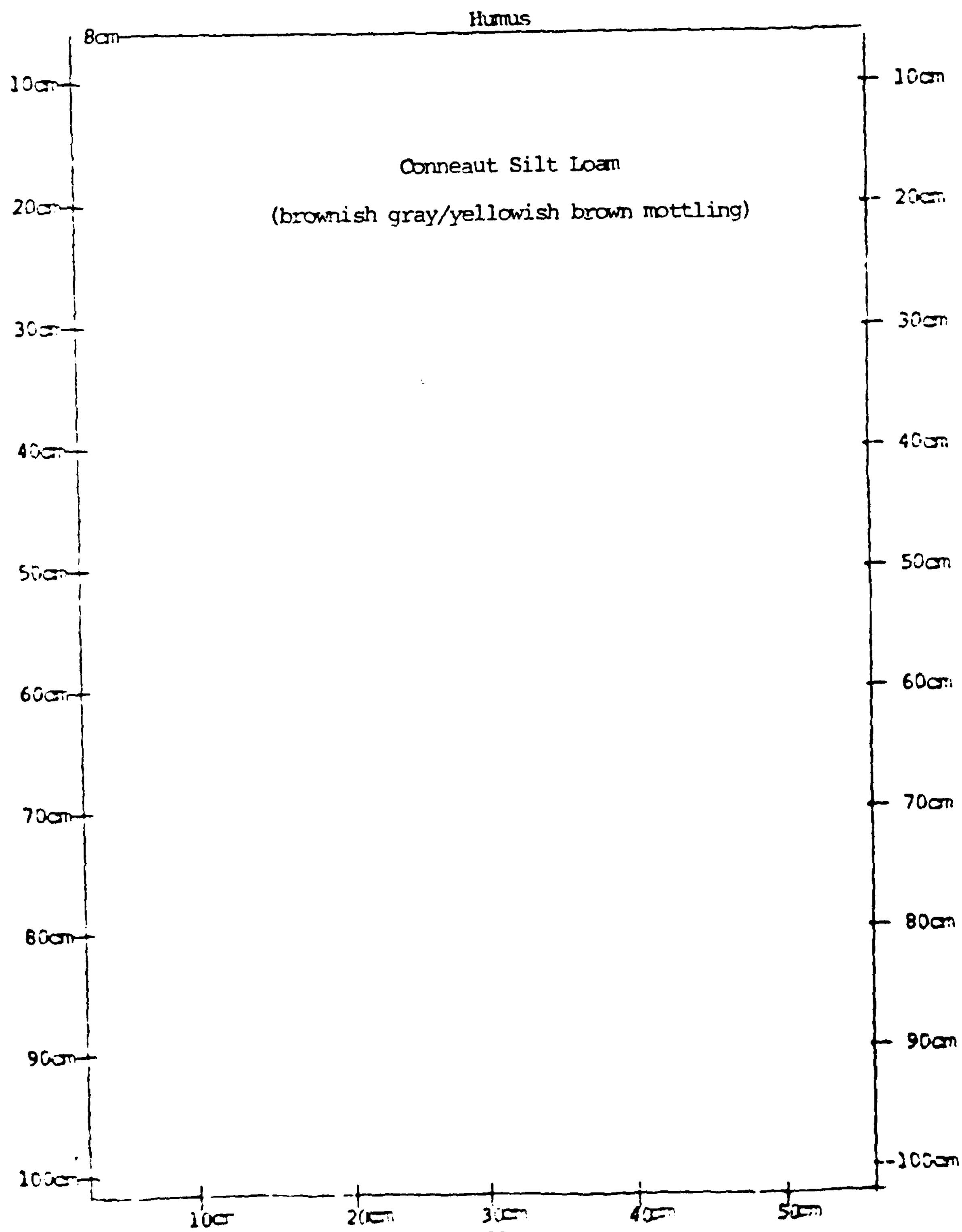
Test Pit Profiles

Project Geneva-on-the-Lake, Ohio

Test Pit No. A4

Date October 4, 1979

Cultural Materials None

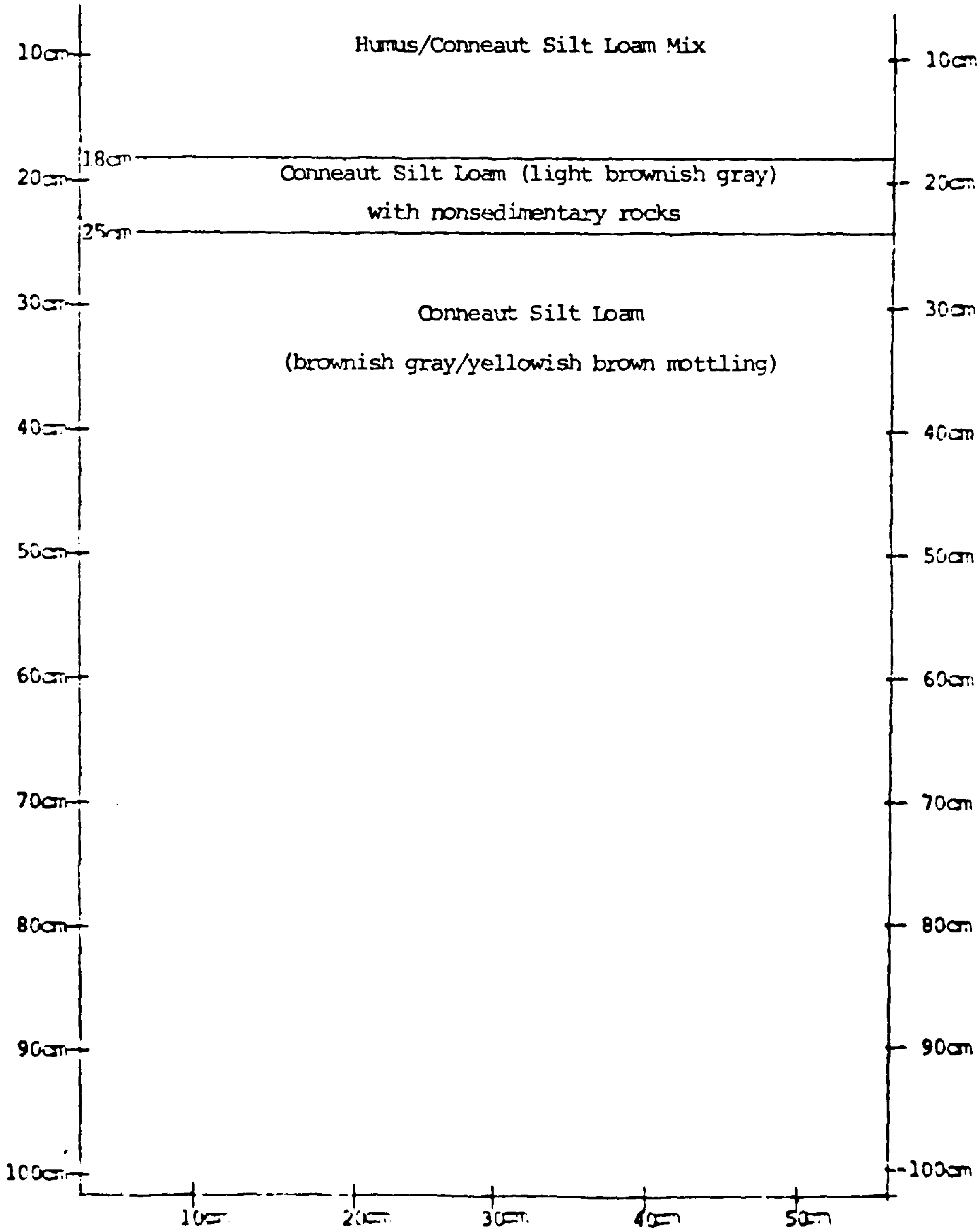


Project Geneva-on-the-Lake, Ohio

Test Pit No. B4

Date October 4, 1979

Cultural Materials None

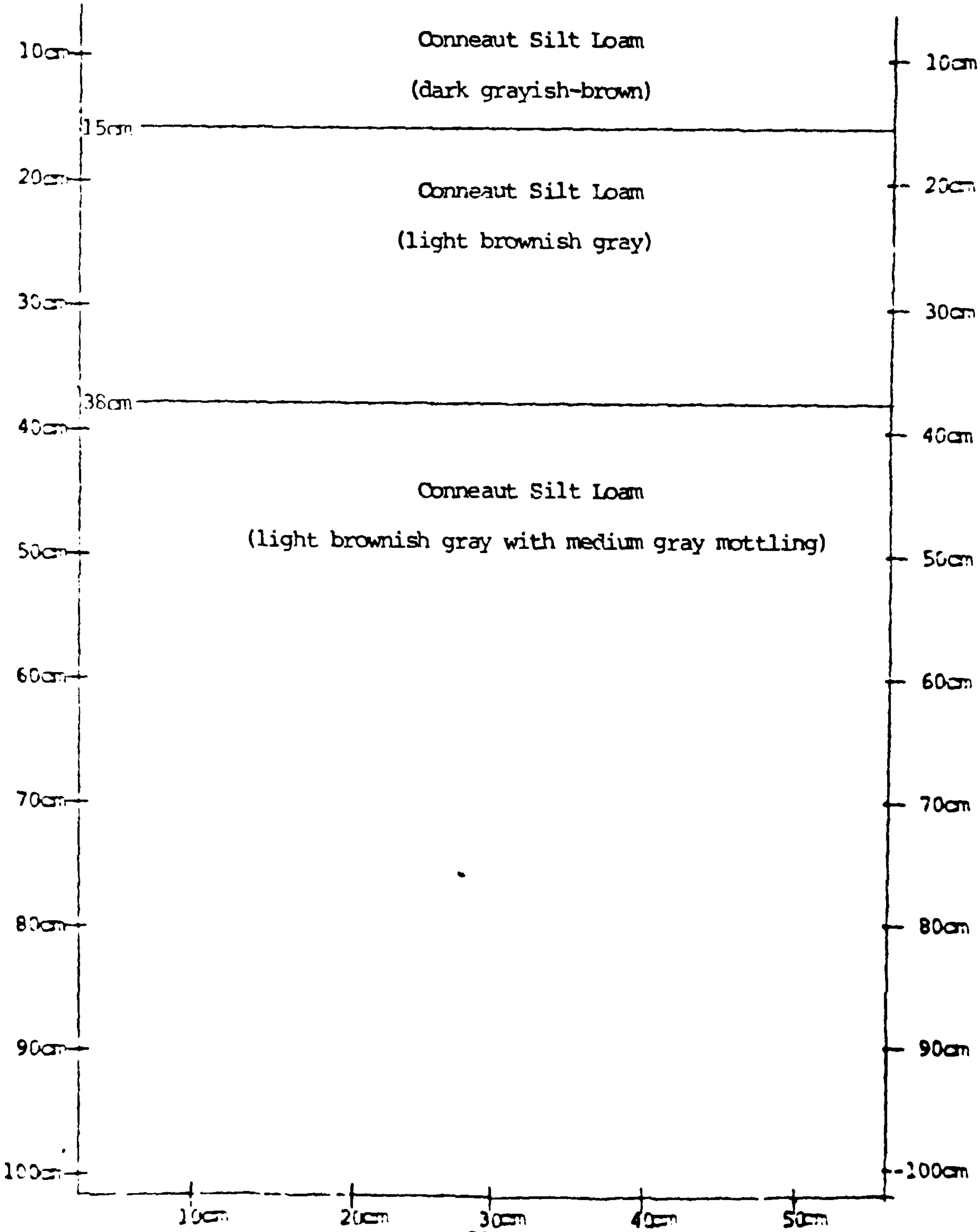


Project Geneva-on-the-Lake, Ohio

Test Pit No. C4

Date October 4, 1979

Cultural Materials None



Project Geneva-on-the-Lake, Ohio

Test Pit No. D4

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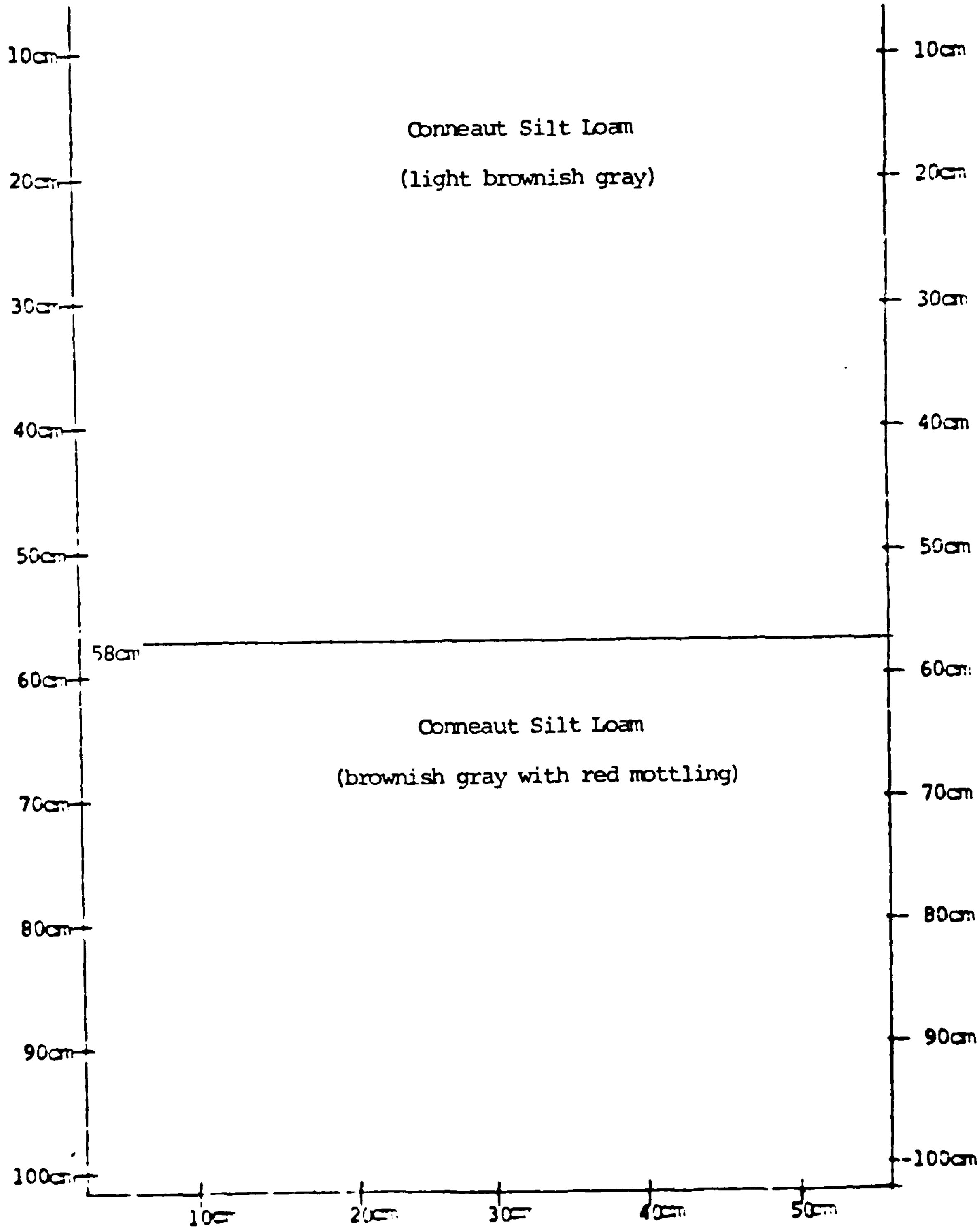
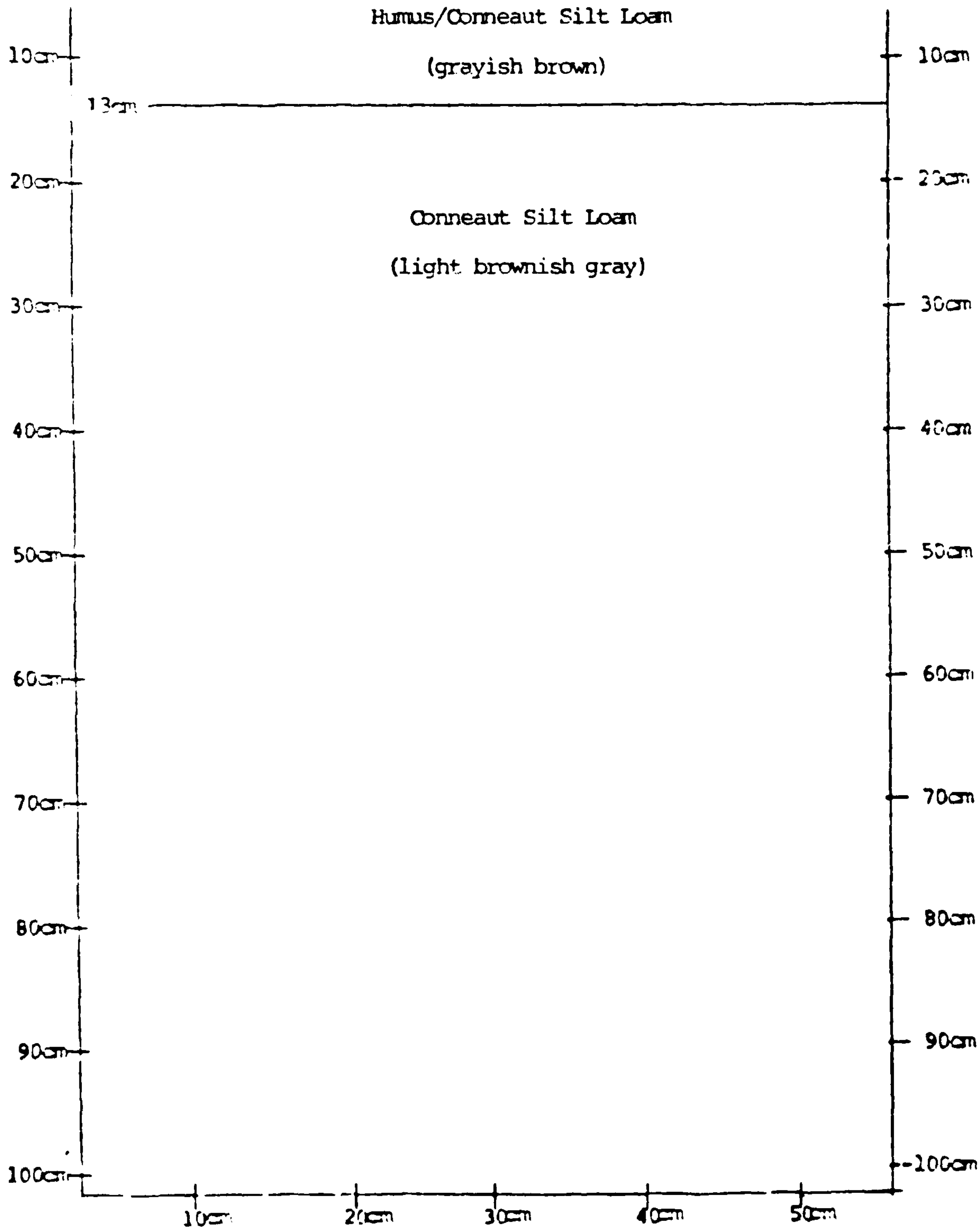


Project Geneva-on-the-Lake, Ohio

Test Pit No. A5

Date October 4, 1979

Cultural Materials None

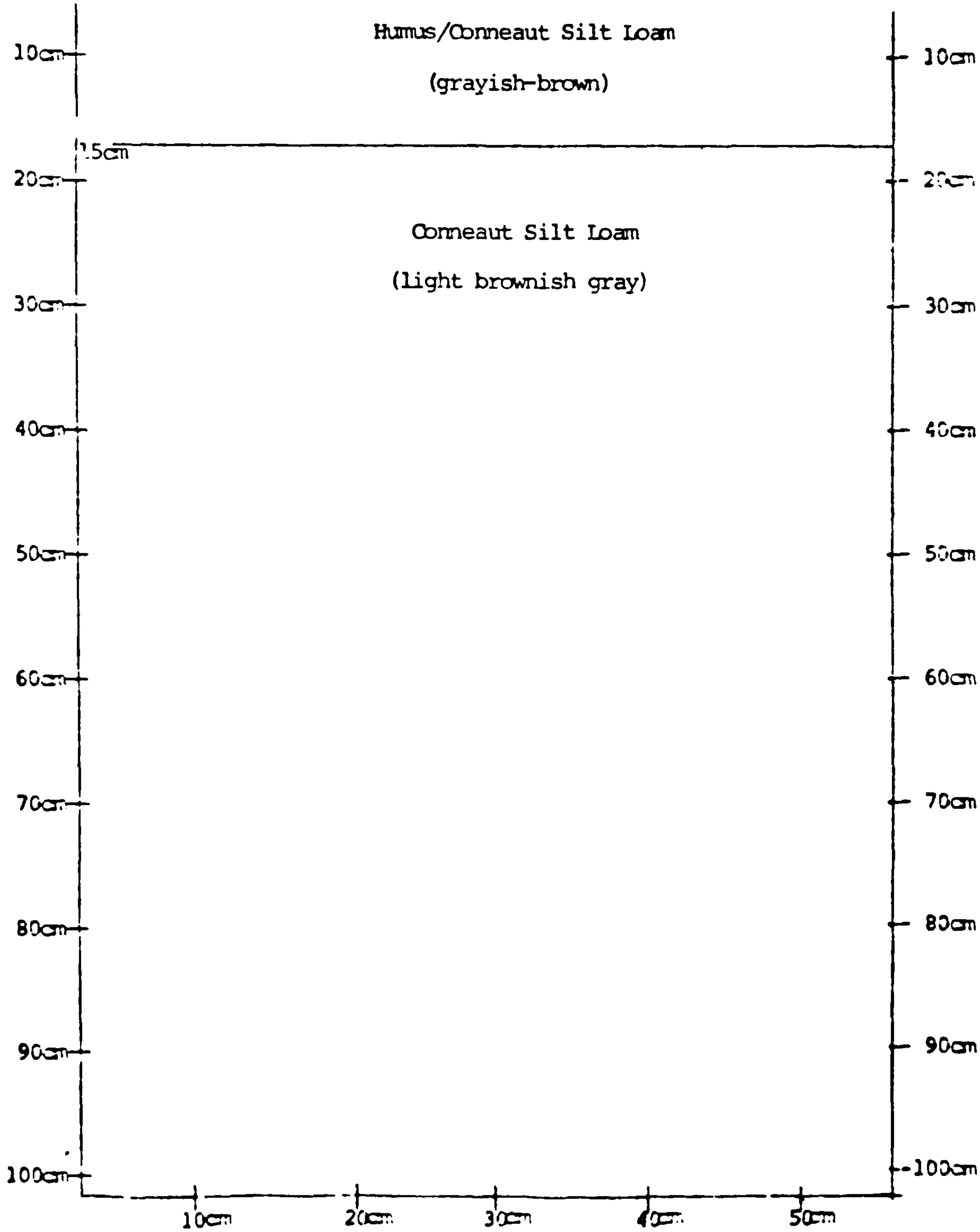


Project Geneva-on-the-Lake, Ohio

Test Pit No. B5

Date October 4, 1979

Cultural Materials None



Project Geneva-on-the-Lake, Ohio

Test Pit No. C5

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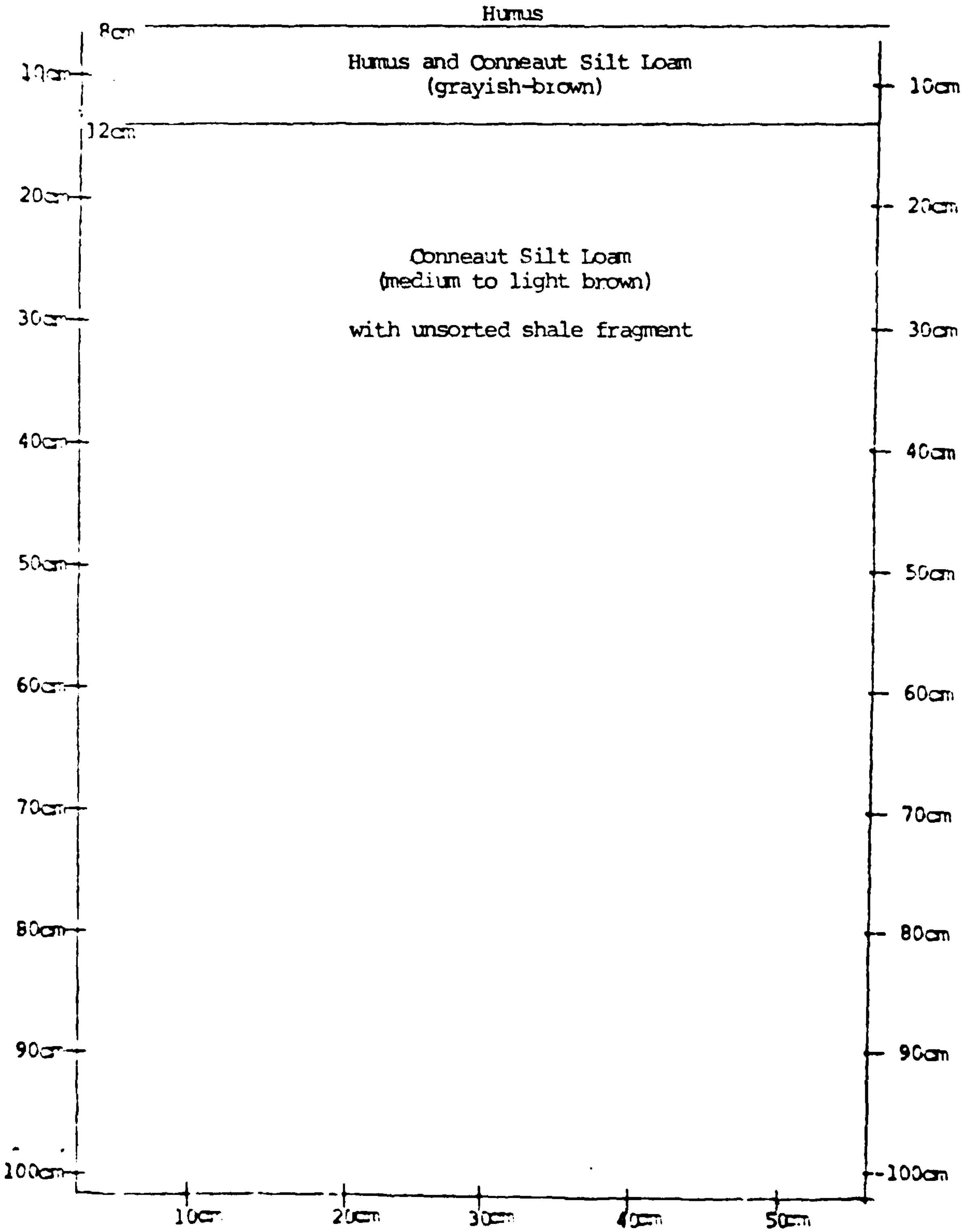
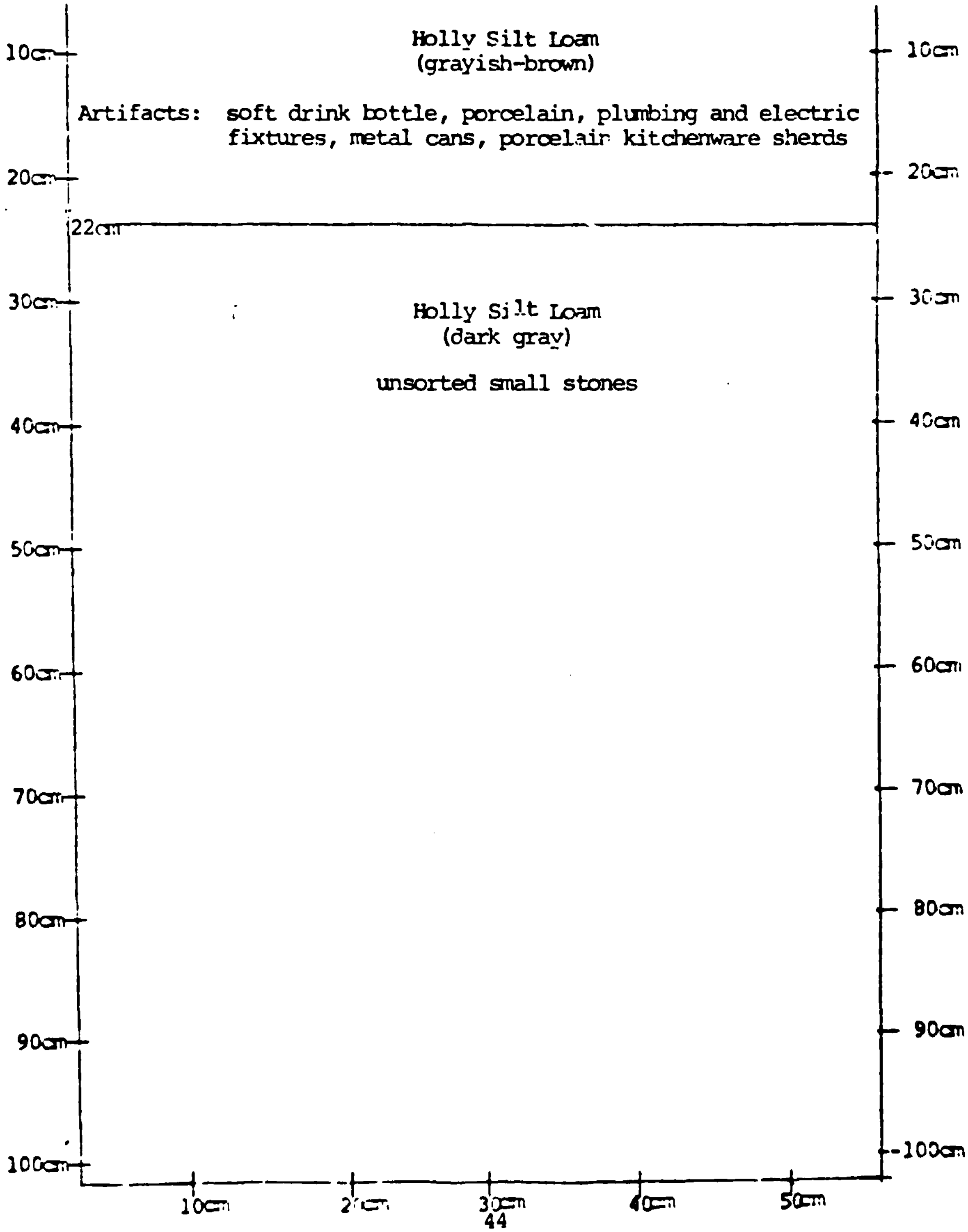


Project Geneva-on-the-Lake, Ohio

Test Pit No. D5

Date October 4, 1979

Cultural Materials 20th century artifacts (see below)

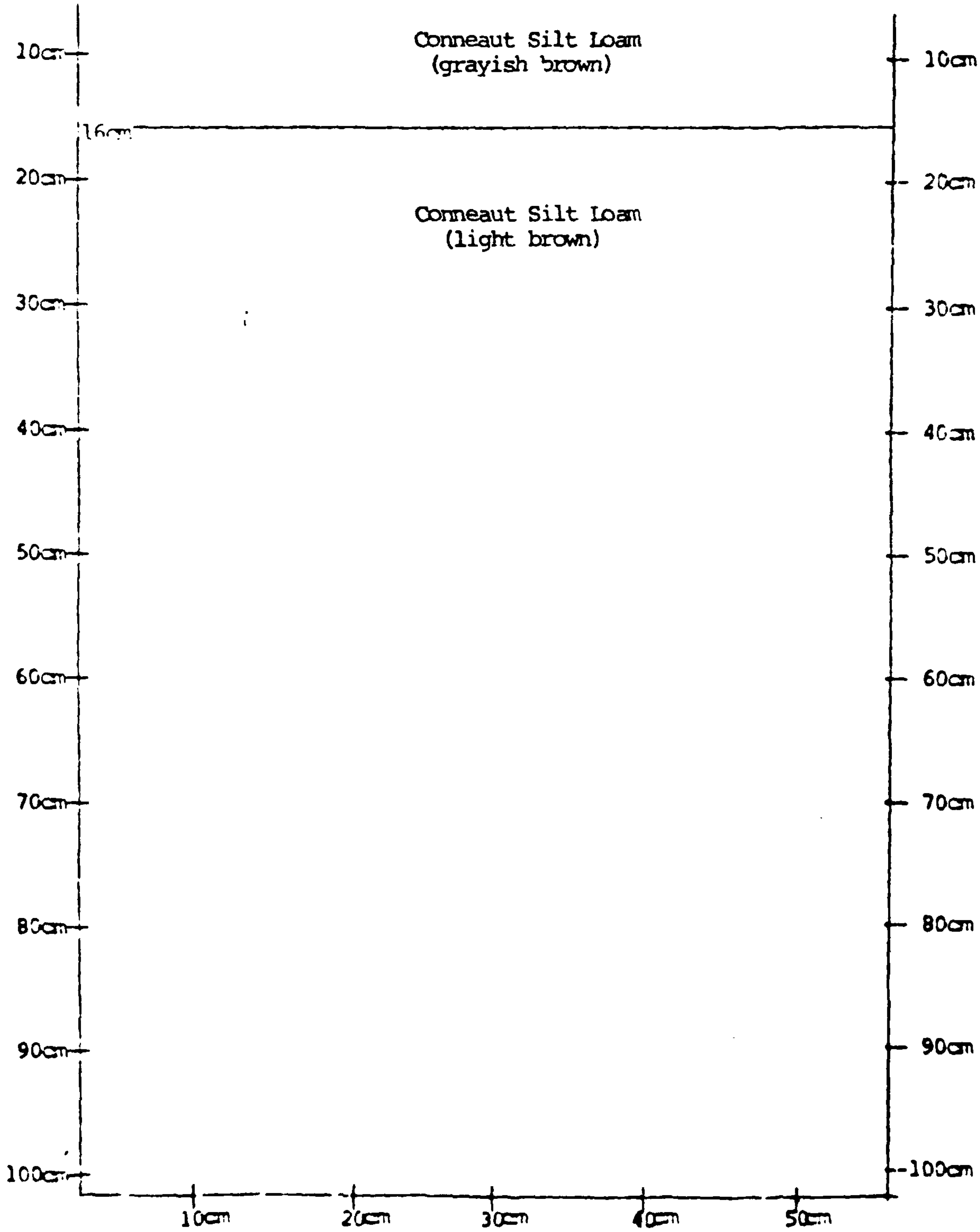


Project Geneva-on-the-Lake, Ohio

Test Pit No. A6

Date October 4, 1979

Cultural Materials None

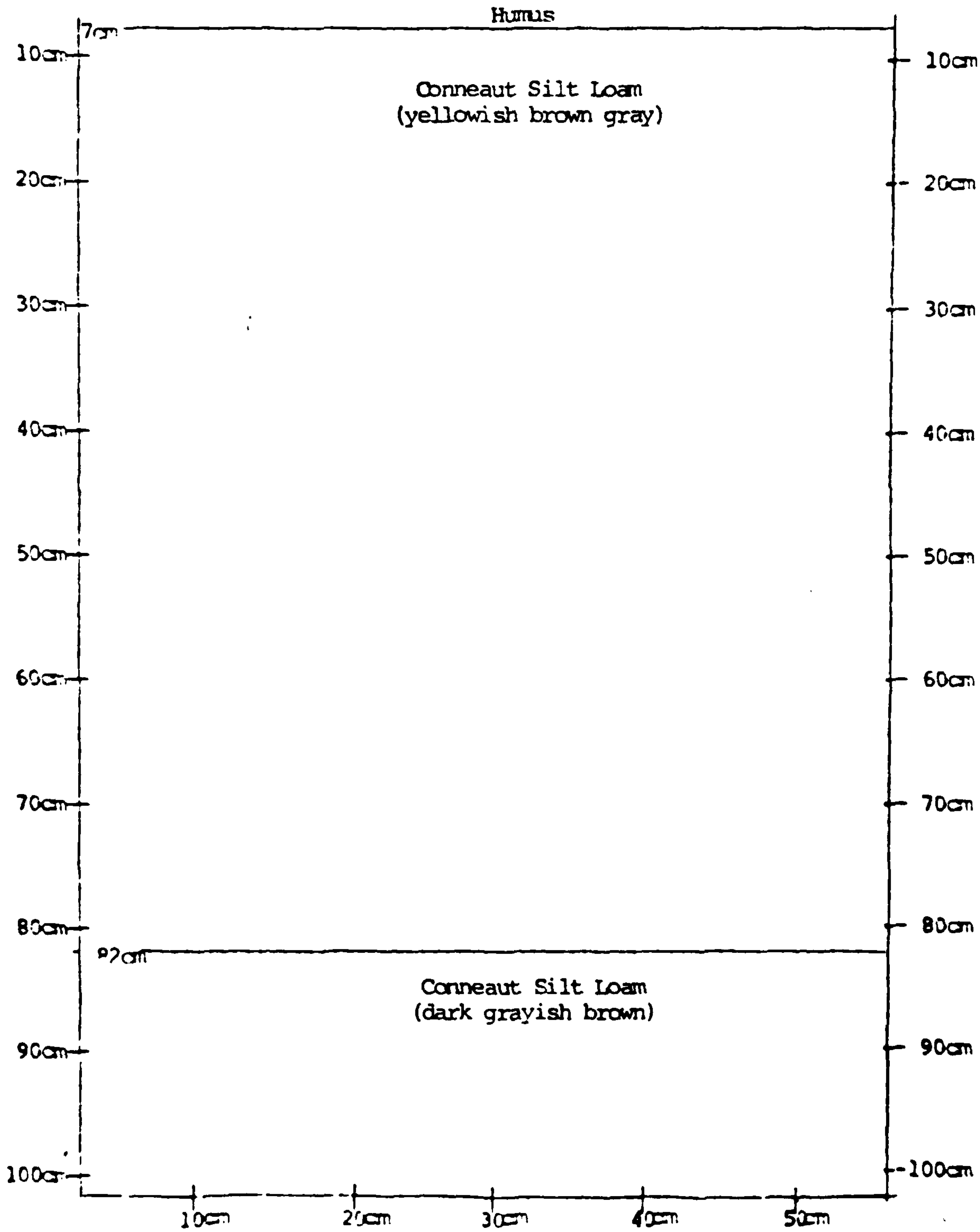


Project Geneva-on-the-Lake, Ohio

Test Pit No. B6

Date October 4, 1979

Cultural Materials None



Project Geneva-on-the-Lake, Ohio

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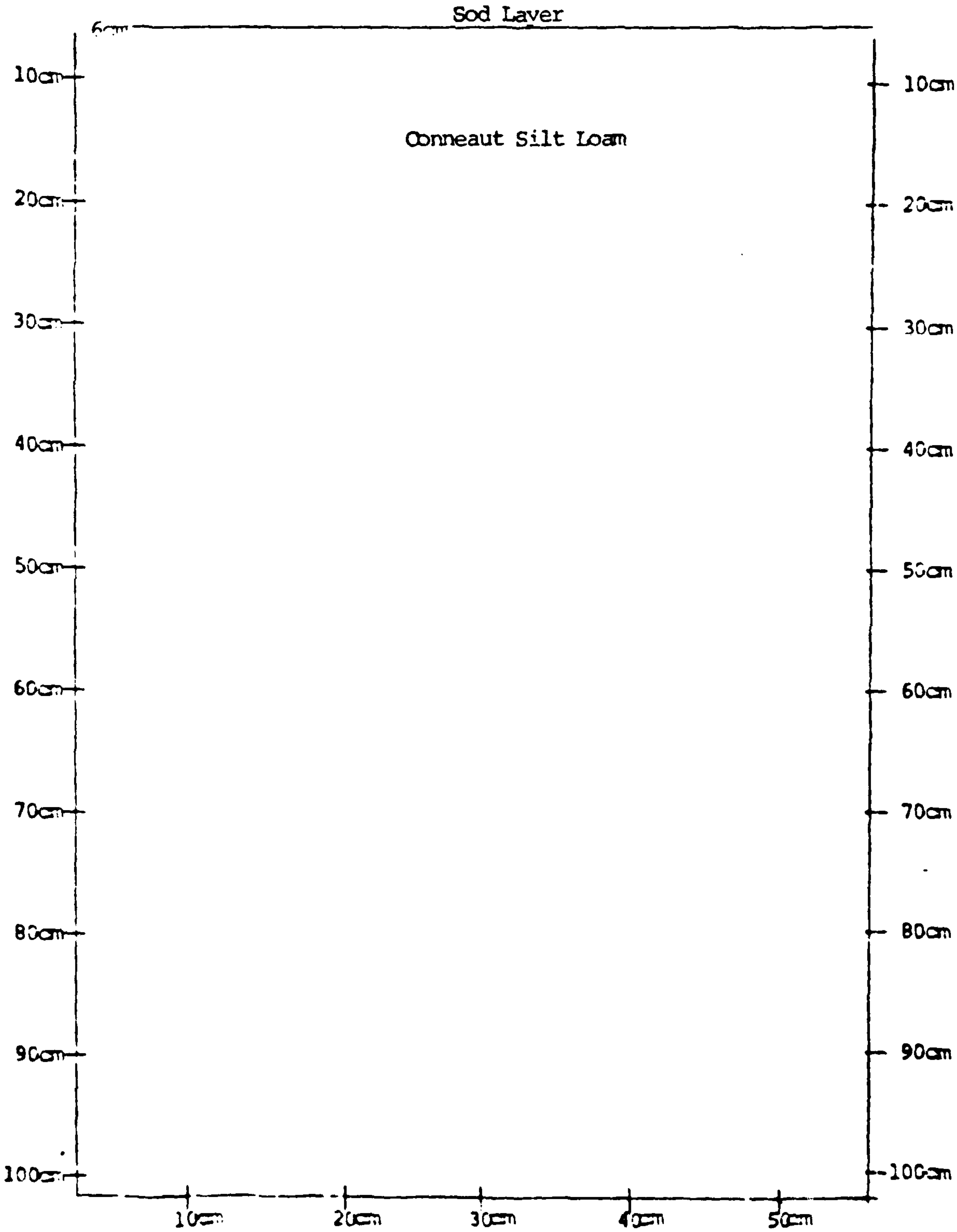
Date October 4, 1979

Cultural Materials None

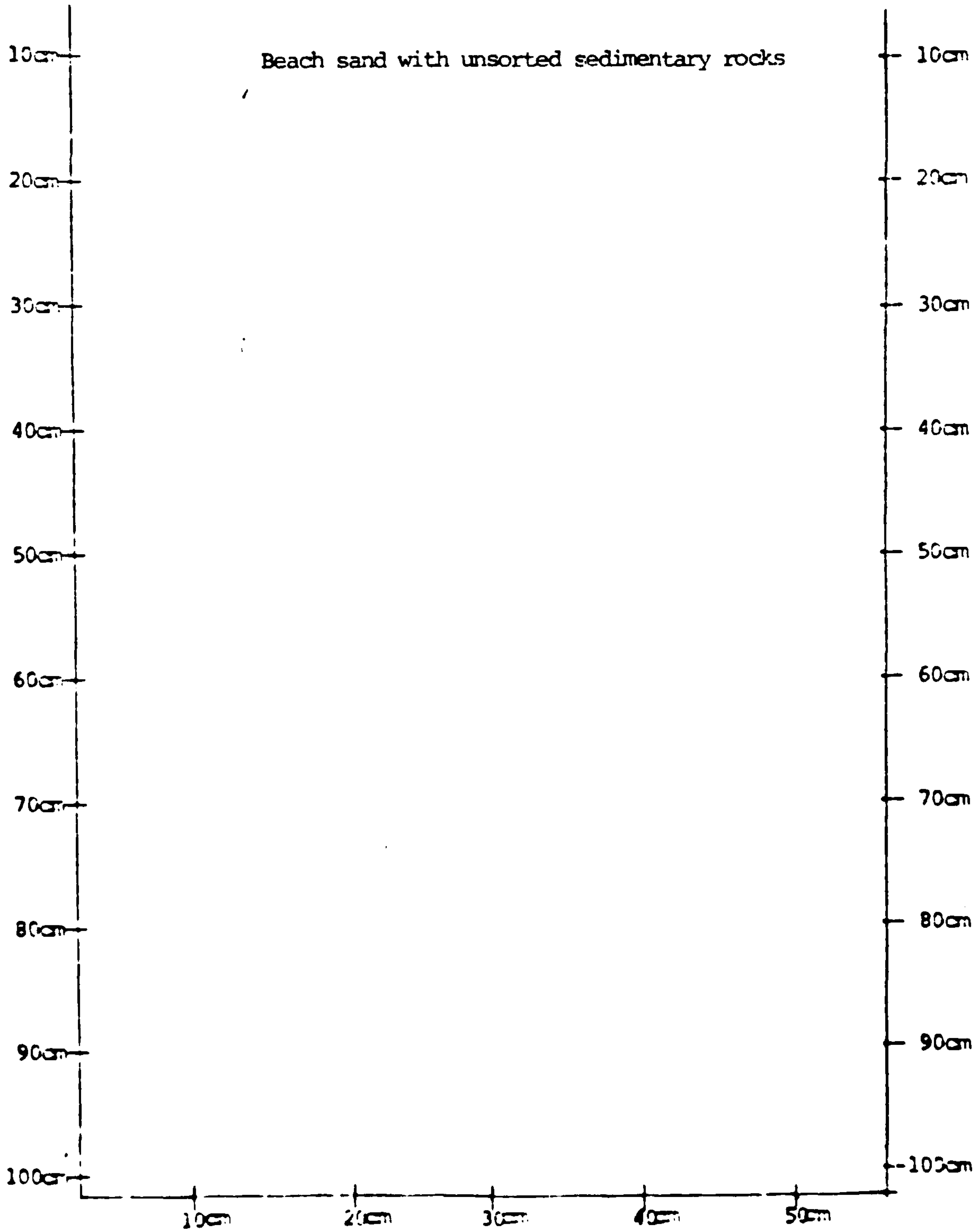


Project Geneva-on-the-Lake, Ohio

Test Pit No. F3

Date October 5, 1979

Cultural Materials None

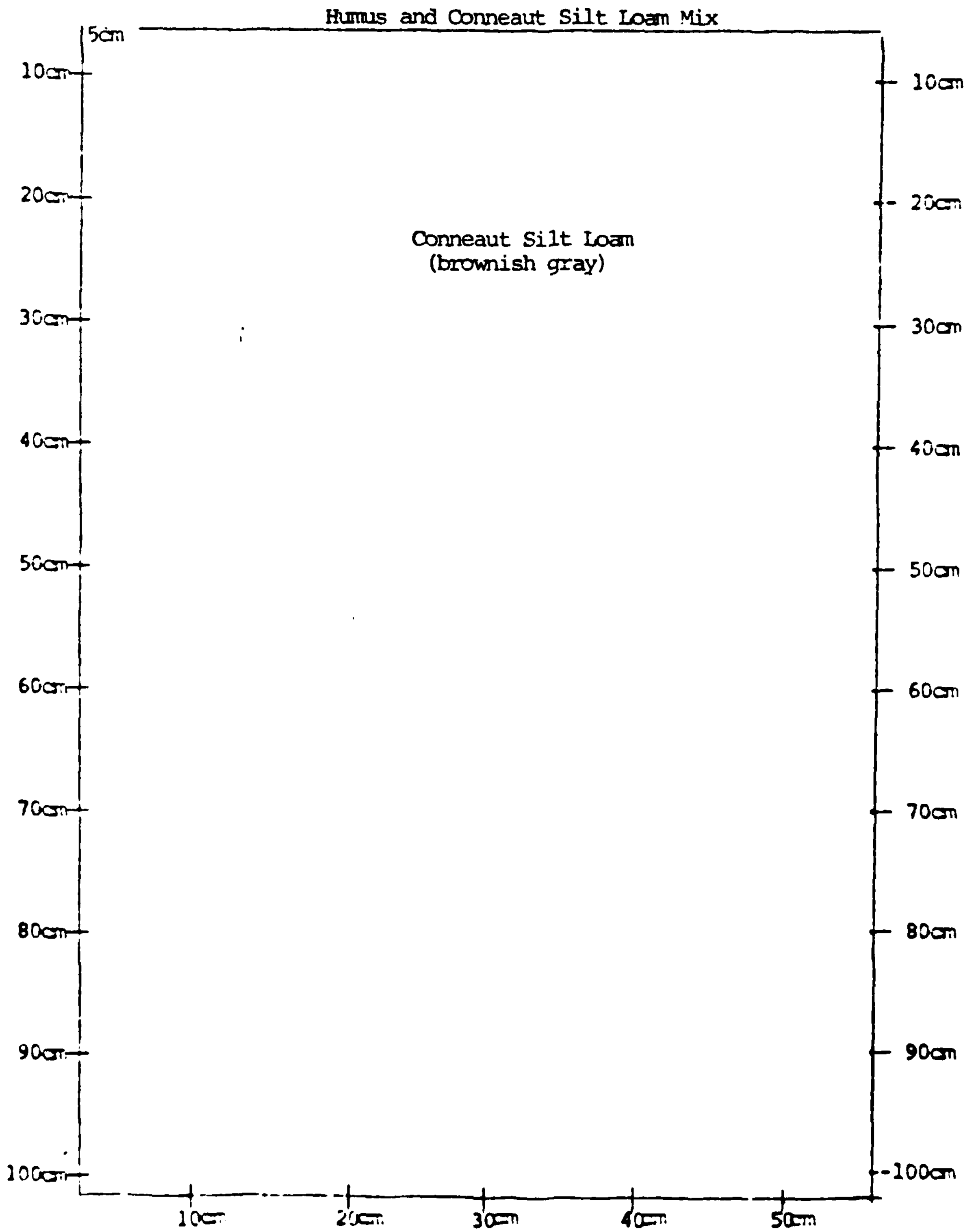


Project Geneva-on-the-Lake, Ohio

Test Pit No. G4

Date October 5, 1979

Cultural Materials None

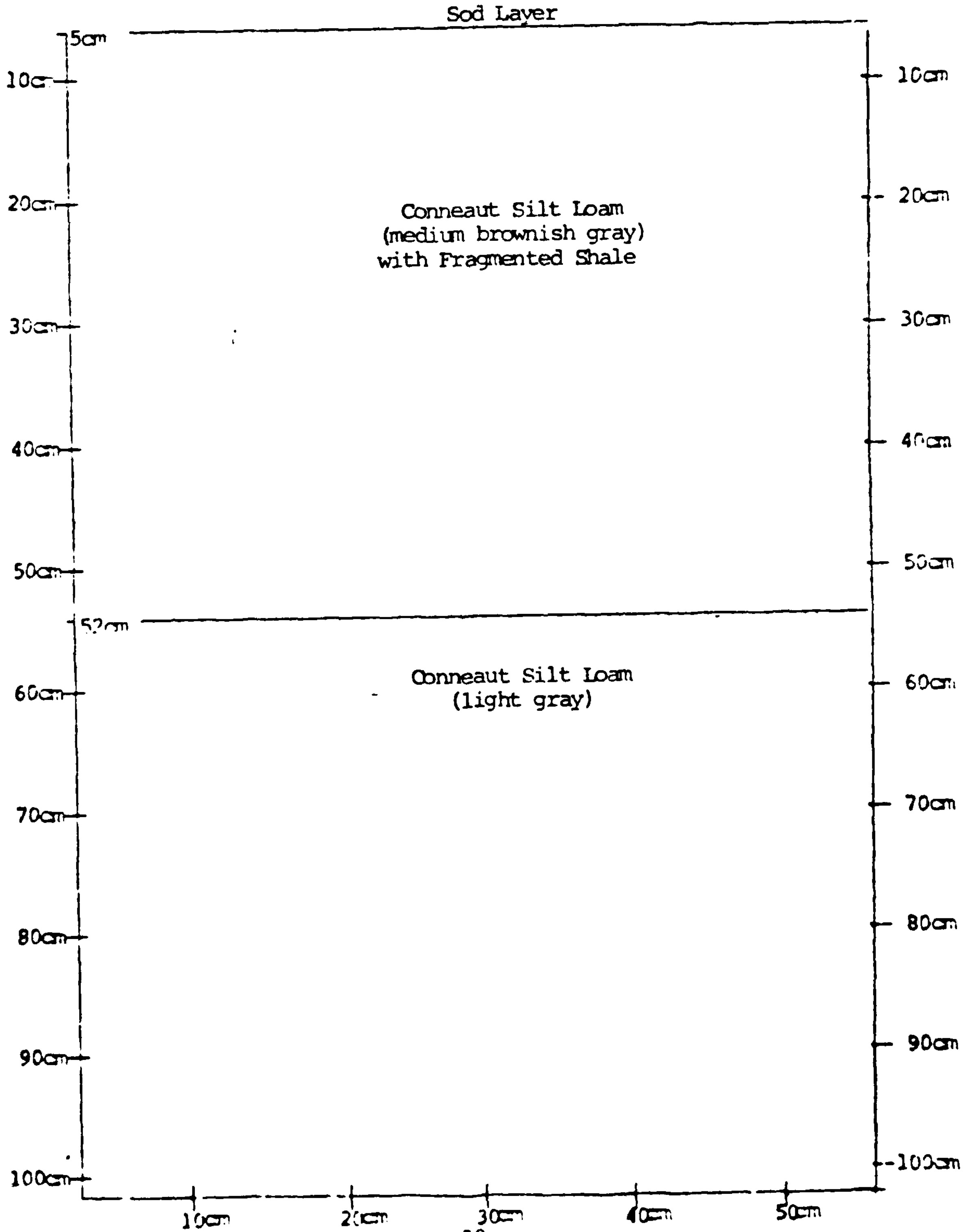


Project Geneva-on-the-Lake, Ohio

Test Pit No. K5

Date October 3, 1979

Cultural Materials None

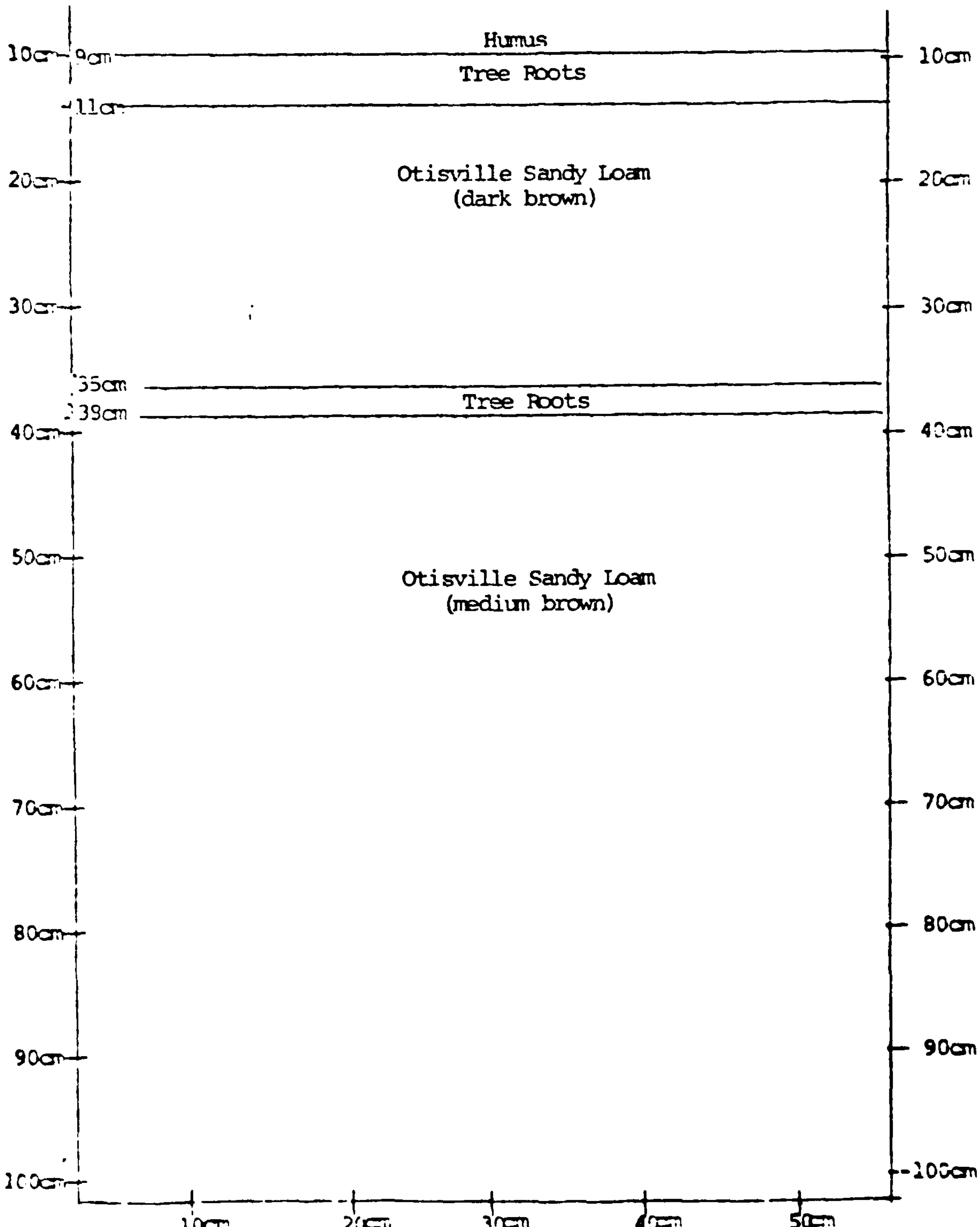


Project Geneva-on-the-Lake, Ohio

Test Pit No. Q5

Date October 5, 1979

Cultural Materials None

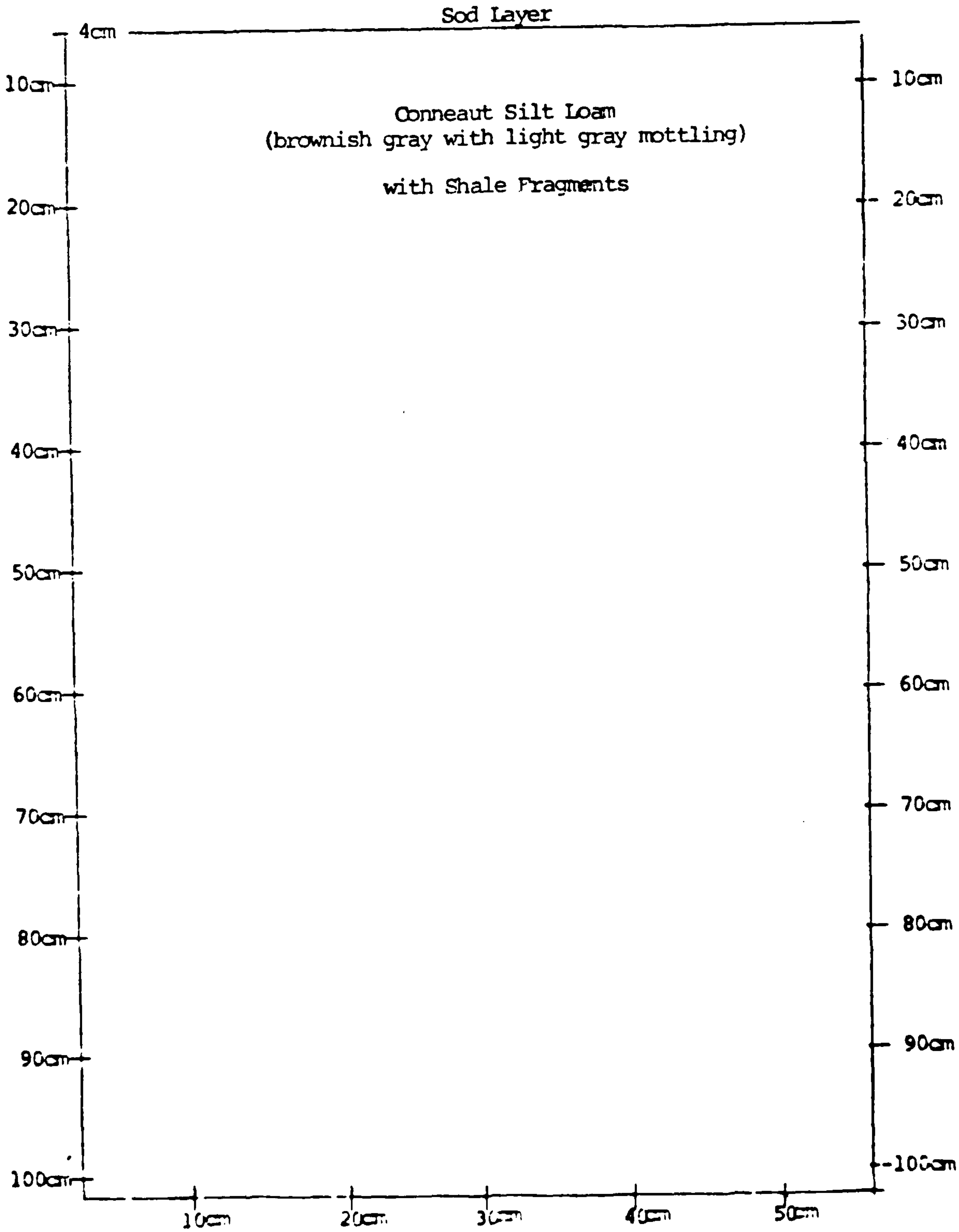


Project Geneva-on-the-Lake, Ohio

Test Pit No. I5

Date October 3, 1979

Cultural Materials None



Project Geneva-on-the-Lake, Ohio

Test Pit No. H7

Date October 4, 1979

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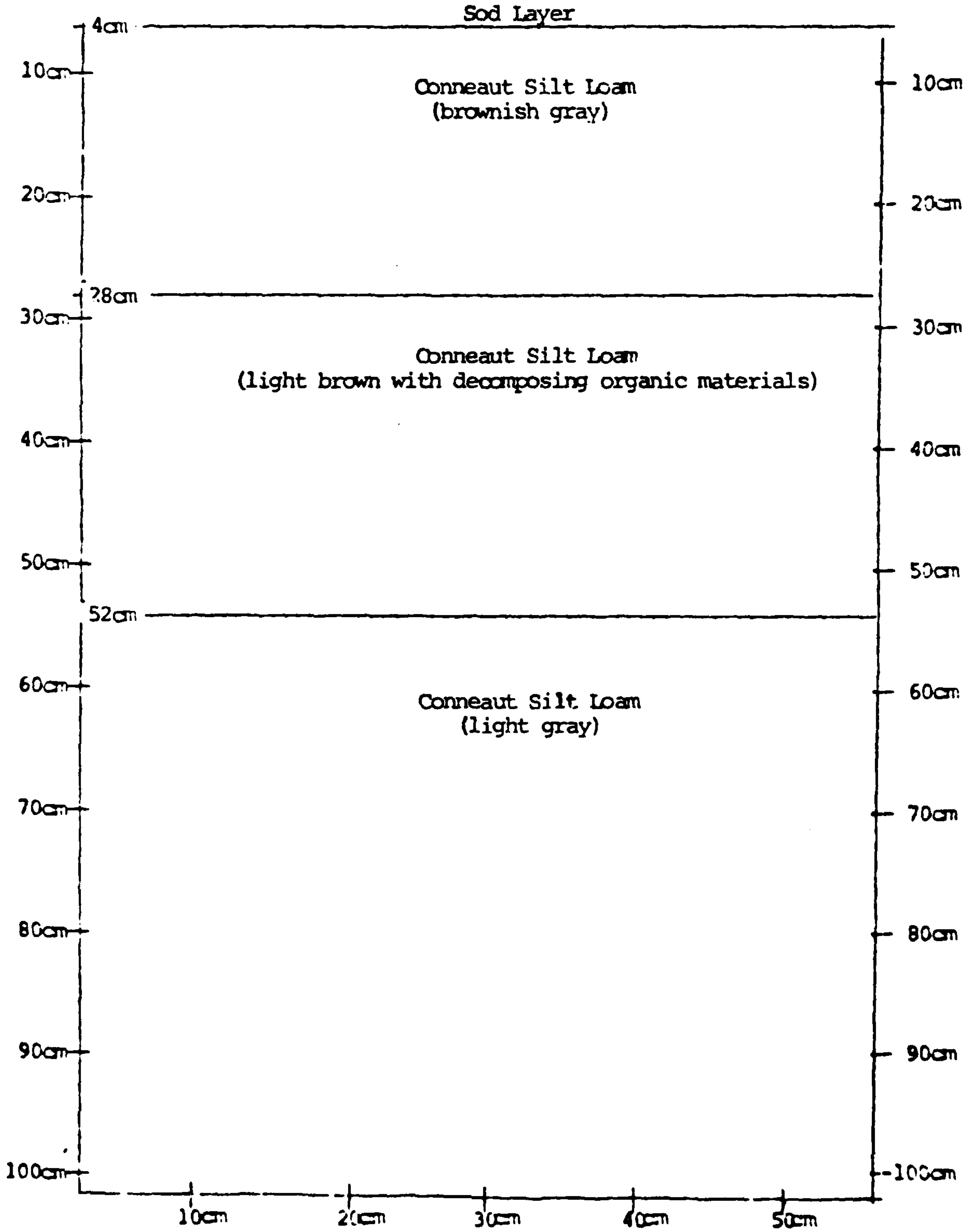
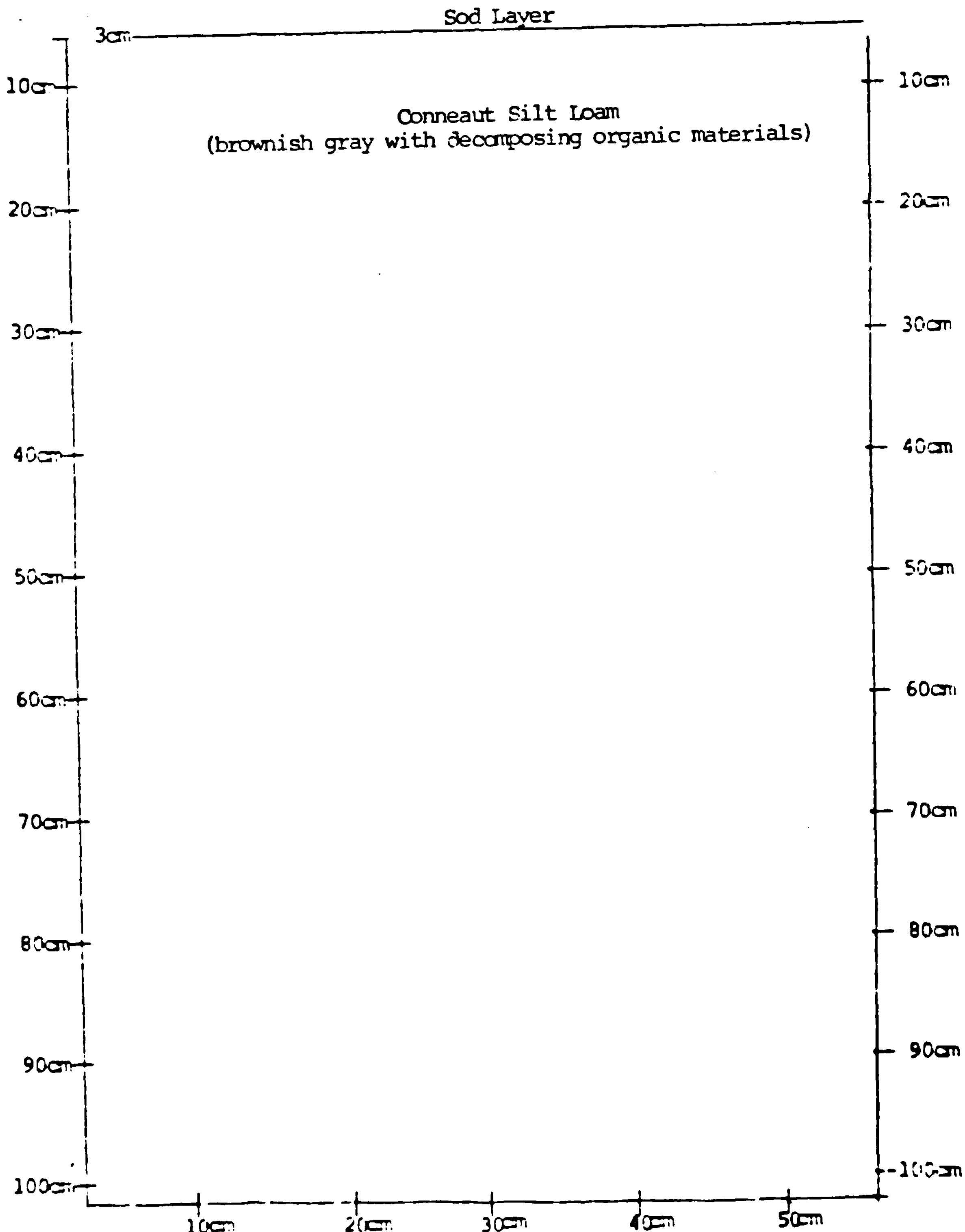


Project Geneva-on-the-Lake, Ohio

Test Pit No. 18

Date October 4, 1979

Cultural Materials None



Project Geneva-on-the-Lake, Ohio

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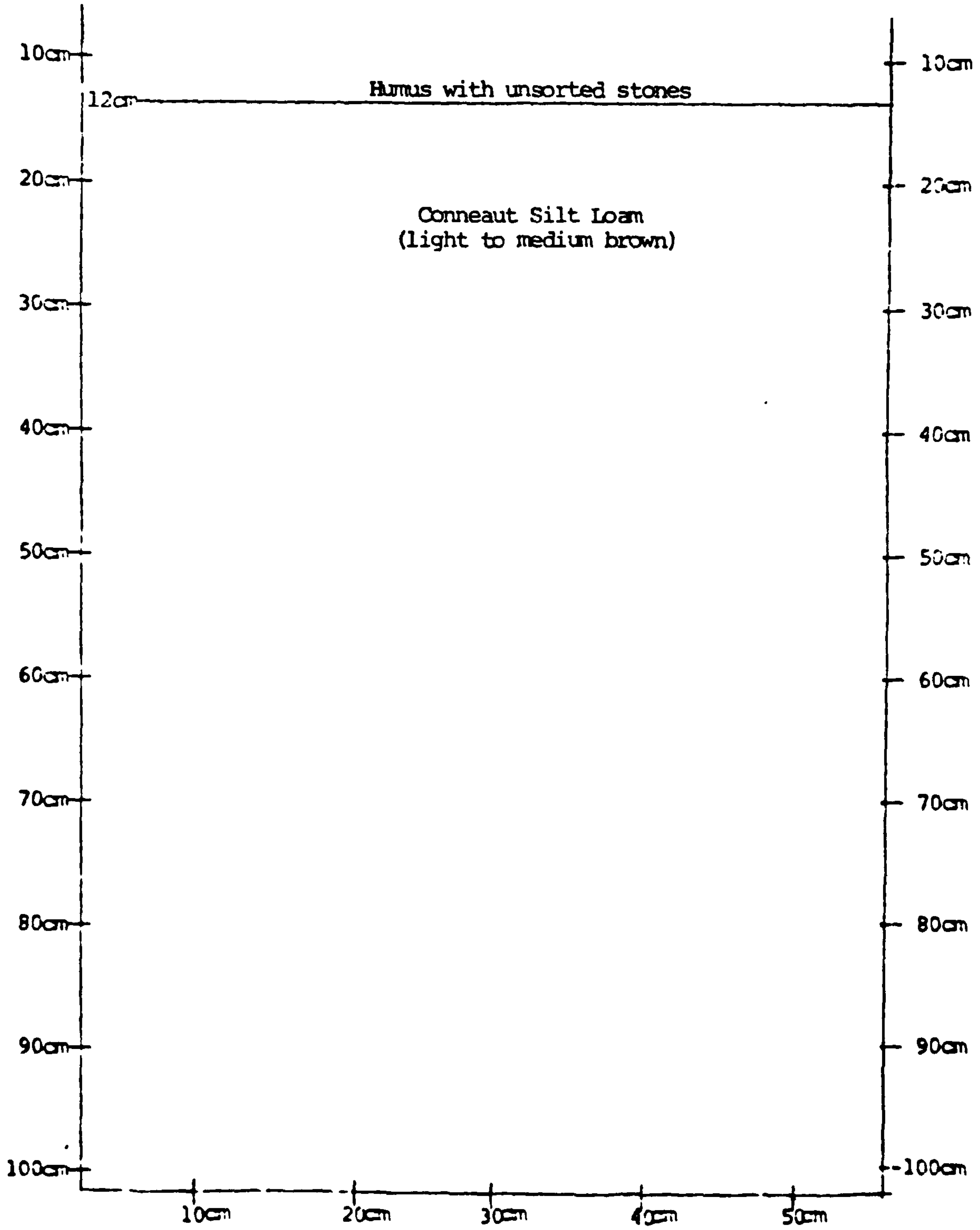
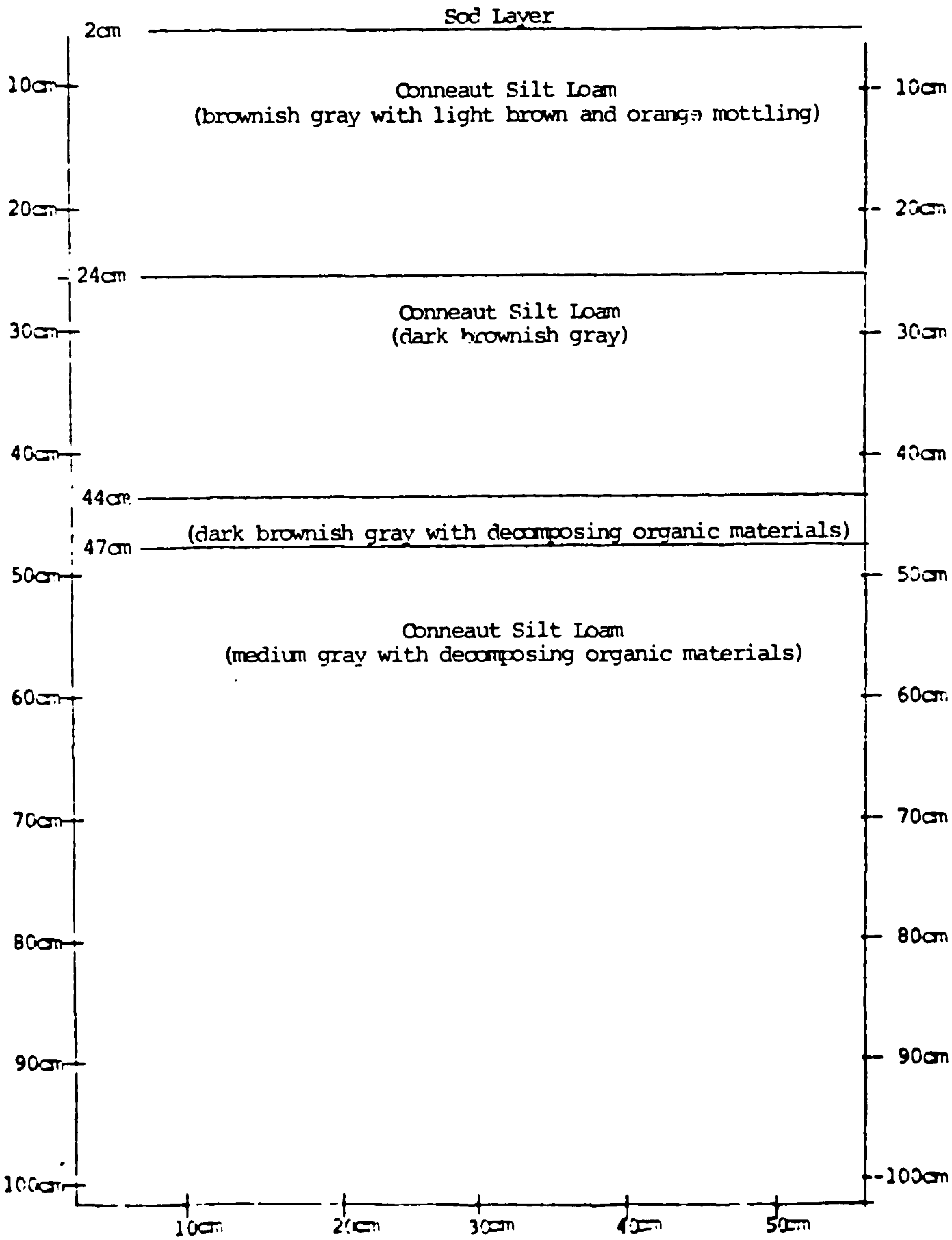


Project Geneva-on-the-Lake, Ohio

Test Pit No. M4

Date October 3, 1979

Cultural Materials None

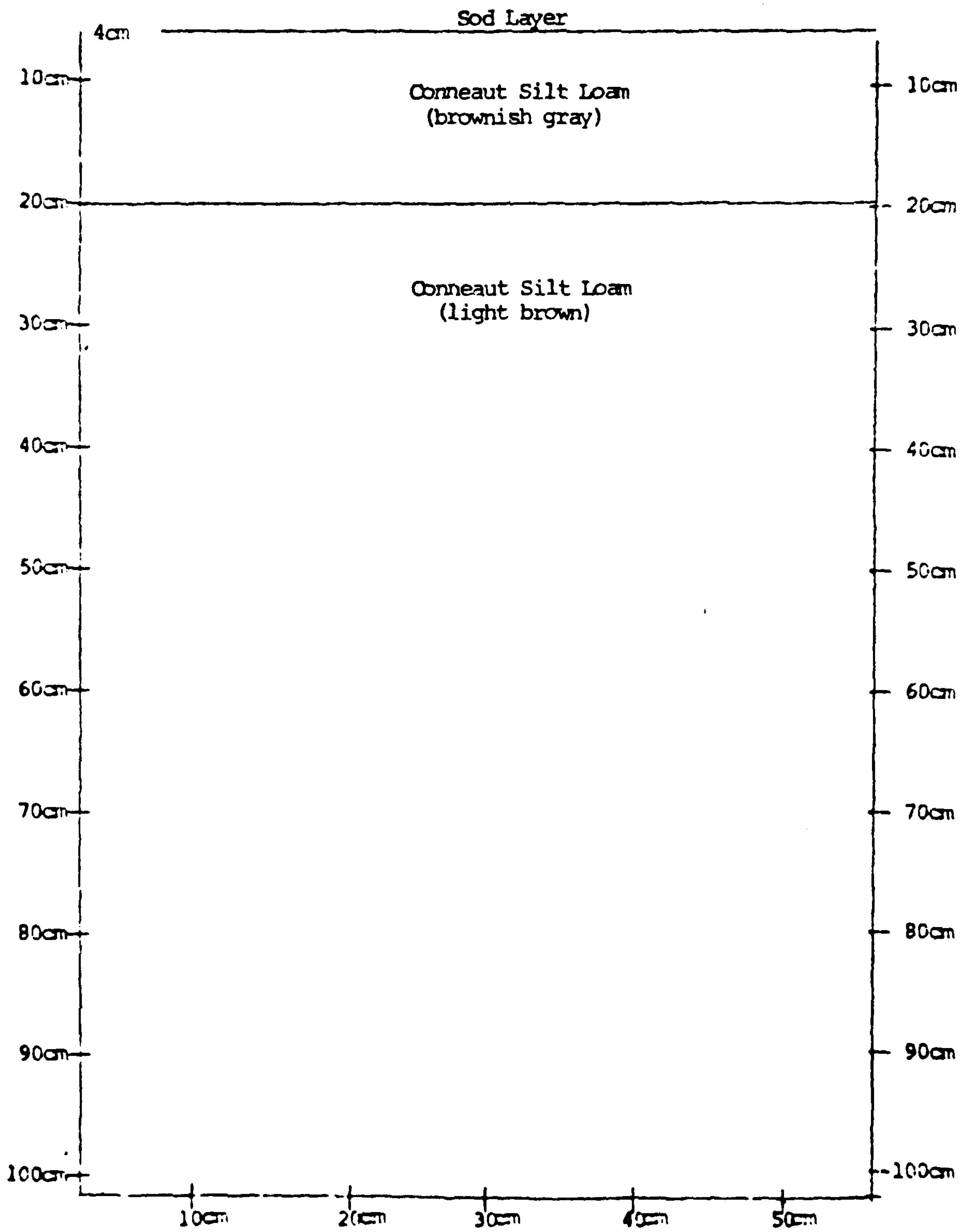


Project Geneva-on-the-Lake, Ohio

Test Pit No. 04

Date October 3, 1979

Cultural Materials None

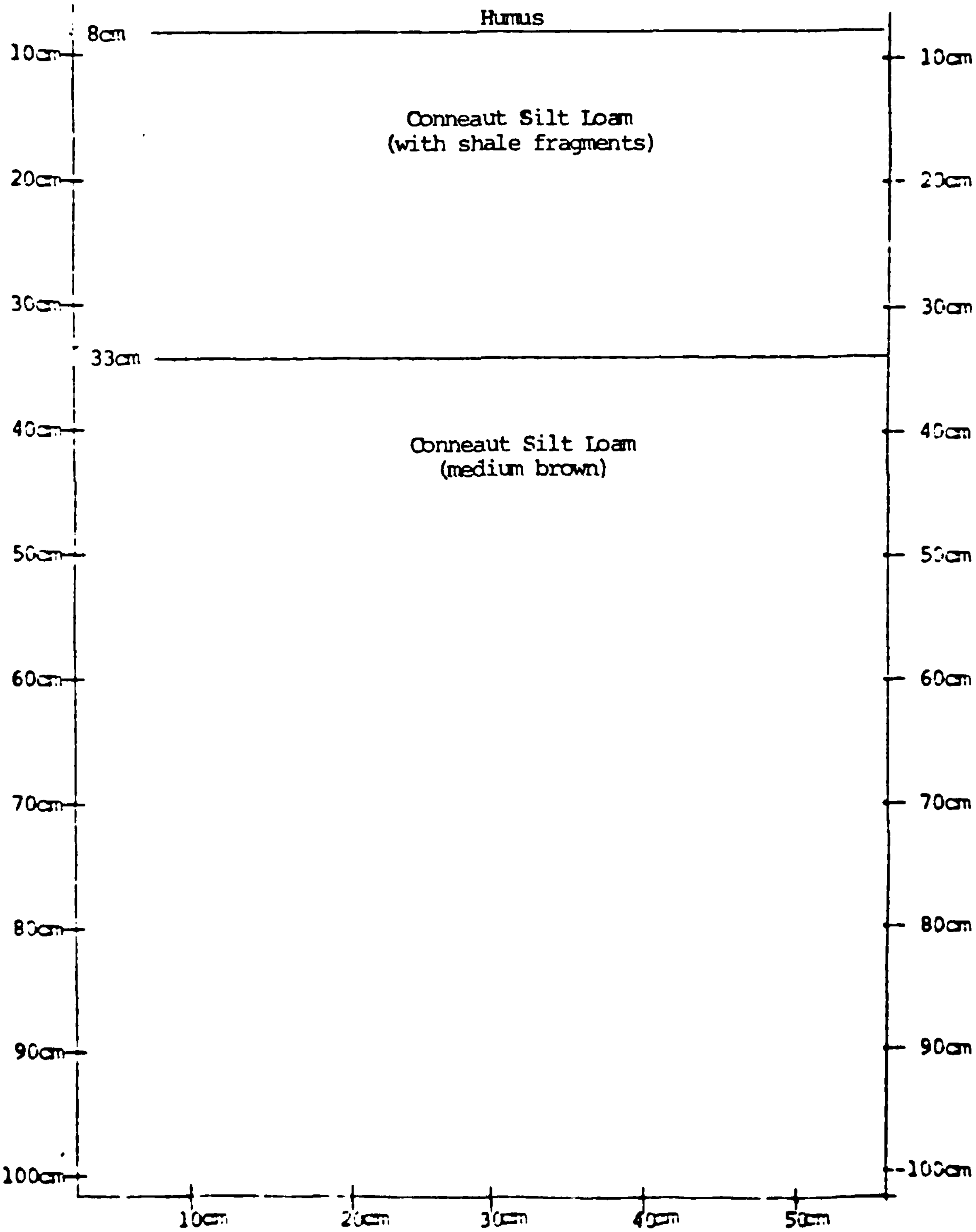


Project Geneva-on-the-Lake, Ohio

Test Pit No. 03

Date October 5, 1979

Cultural Materials None



Project Geneva-on-the-Lake, Ohio

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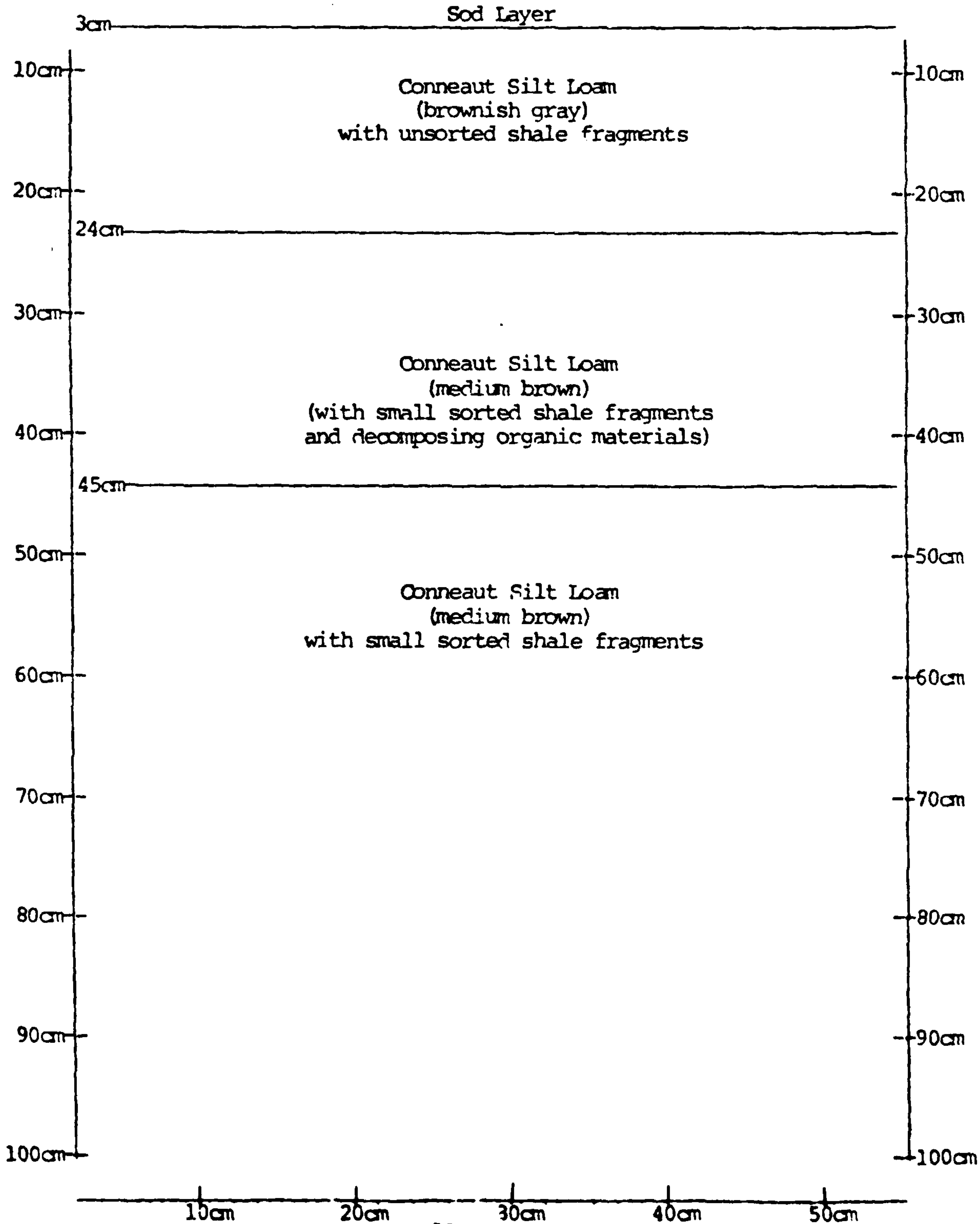
Date October 3, 1979

Cultural Materials None



APPENDIX D

Project Personnel

MARTIN F. MURPHY

PRINCIPAL INVESTIGATOR and
ARCHEOLOGY PROJECTS ADMINISTRATOR

EDUCATION:	Ph.D., (in progress) Anthropology, Columbia University
	M.A., Anthropology, Syracuse University (1977)
	B.A., (Licenciatura), Anthropology, Universidad de las Americas, Puebla, Mexico (1973)
RESEARCH POSITIONS:	1979 - Principal Investigator and Archeology Projects Administrator. P/RA Research, Inc., 1905 Hempstead Turnpike East Meadow, New York, 11561
	1977 - Graduate Research Intern. U.S. Department of State, Agency for International Development, Washington, D.C.
	1976-1977 - Research Assistant, Health Studies Program, Maxwell School of Citizenship and Public Affairs, Syracuse University, Syracuse, N.Y.
TEACHING POSITIONS:	1979 - Adjunct Instructor. LaGuardia Community College (CUNY) Long Island City, N.Y.
	1979 - Adjunct Instructor. St. Joseph's College/C.W. Post College, Brentwood, N.Y.
	1976-1977 - Teaching Assistant. Department of Anthropology Syracuse University, Syracuse, N.Y.
ARCHEOLOGICAL RESEARCH EXPERIENCE:	1979 - Ft. Devens Cultural Resources Survey. Ft. Devens, Massachusetts and off-base facilities, Affiliation: P/RA Research, Inc.
	1979 - Ft. Sheridan Cultural Resources Survey. Ft. Sheridan, Illinois, Affiliation: P/RA Research, Inc.
	1979 - Lake Frederick and Indoor Athletic Facility Survey. U.S. Military Academy, West Point, N.Y. Affiliation: P/RA Research, Inc.

1973 - Pre-Columbian Burial Site Excavation. Cholula, Puebla; Mexico. Affiliation: Universidad de las Americas

1972 - Pre-Columbian Ceremonial Site Survey. State of Mexico Affiliation: Universidad de las Americas

1971 - Paleolithic Kill Site Excavation. Greenville, Ohio Affiliation: Kent State University

ACADEMIC AWARDS AND HONORS:

M & F Scholarship. Columbia University; New York, New York (1979 - 1980)

President's Fellow. Columbia University; New York, New York (1978 - 1979)

Graduate Research Intern. U.S. Department of State Graduate Student Intern Program. Agency for International Development Washington, D.C. (6/77 - 9/77)

Research and Teaching Assistantship. Department of Anthropology and Health Studies Program, Maxwell School of Citizenship and Public Affairs. Syracuse University; Syracuse, N.Y. (9/76 - 5/77)

ANNETTE SILVER

SENIOR ARCHAEOLOGIST

EDUCATION: M.A., Anthropology, New York University, New York. Financed partial expenses with one-year University Scholorship awarded on basis of merit.

B.A., Anthropology, Bryn Mawr College, Bryn Mawr, Pennsylvania.

Additional Graduate Study in Anthropology: Columbia University School of General Studies. Graduate School of New School of Social Research.

WORK EXPERIENCE:

1979 P/RA Research, Inc., 1905 Hempstead Turnpike, East Meadow, New York. Senior archaeologist.

1979 Vollmer Associates, 65 Fifth Avenue, New York, New York. Archaeologist.

1979 Slaughter Creek Cultural Resources Survey, State of Delaware, Dover, Delaware. Archaeologist.

1977 Archaeologist Field School, New York University. Dr. Bert Salwen, Director.

1972-1976 Nassau County Museum, Garvies Point Facility Docent and Field crew member.

PUBLICATIONS: Cultural Resource Predictive Model Literature and Records Search for Conesus Lake, New York. February 1980. (co-author: Martin Murphy).

PAPERS IN PROGRESS: "Further applications of Pollen Diagram Studies in Archaeology" "Cherokee Myth and Ritual"

PROFESSIONAL ORGANIZATIONS: American Anthropological Association
Society for American Archaeology
Suffolk County Archaeological Association

APPENDIX

Letters of Comment

DEPARTMENT OF THE ARMY
BUFFALO DISTRICT, CORPS OF ENGINEERS
1776 NIAGARA STREET
BUFFALO, NEW YORK 14207

NCBED-P Re: Contract No. DACW49-79-C-0088 12 February 1980

Mr. Jerry Ginsberg
PR/A Research Inc.
1905 Hempstead Turnpike
East Meadow, New York 11544

Dear Mr. Ginsberg:

Enclosed are reviews from the Buffalo District, the Ohio State Historic Preservation Office, and the Regional Archaeological Preservation Office regarding the cultural resources reconnaissance survey report written by your firm under the referenced contract. These comments should be considered when you prepare the report for final submittal and included in an appendix to the final report. The Scope of Work for this project should also be included as an appendix.

Your cooperation in this matter is appreciated.

Sincerely,

BRUCE I. SANDERS
Contracting Officer's Representative

3 Incls
as stated

Sheet 1 of ___

BUFFALO DISTRICT

Branch/Office NCBED-PE Reviewer Richard Lewis Ext. No. 2171

Subject: Cultural Resource Reconn. Geneva-on-the-Lake Date 1/8/80

CMT. NO.	Dwg. or Para. No.	COMMENT
1	Cover Sheet	The number DACW49-79-R-0032 is the solicitation Number not
		the contract number. The contract number is DACW49-79-C-0088.
2	Page 5	The sentence "Prior to 1965 the project area was predominantly
		a marshland with two creeks, Cowles Creek and Skin Beach Creek,
		flowing in to Lake Erie." is a bit confusing as it is not clear
		how the creeks are related to the marshland.
3	Page 5	There appears to be a word missing from the sentence which begins:
		"Heading south from these bluffs the terrain..."
4	Page 14	The references in the sentence beginning: "This adds support
		to Funks (1972,1978)..." are confusing. The way it reads Prufer(
		and Baby 1963 quoted Funk(1972,1978)
5	Page 16	The word "numberous" is misspelled.
6.	Page 17	The phrase "New ceramic styles" might be reworded

Incl. 1

BUFFALO DISTRICT

Branch/Office NCBED-PE Reviewer Richard Lewis Ext. No. 2171

Subject: Cultural Resource Reconn. Geneva-on-the-Lake Date 1/8/80

CMT. NO.	Dwg. or Para. No.	COMMENT
7	Page 18	How does the study of Paleo-pathology suggest a subsistence shift
		from mixed maize and hunting to maize.
8	General	With the exception of the comments noted above, the report is of
		very high quality and is acceptable under the terms of the Scope
		of Work.

Ohio Historic Preservation Office
Ohio Historical Center I-71 & 17th Avenue Columbus, Ohio 43211 (614) 466-1500

January 25, 1980

Donald M. Liddell, Chief
Engineering Division
Buffalo District Corps of Engineers
1776 Niagra Street
Buffalo, New York 14207

Re: Cultural Resource Survey
Geneva-on-the-Lake, Ohio
NCBED-PE

Dear Mr. Liddell:

As requested in your letter of January 9, 1980, the staff of the Ohio Historic Preservation Office has reviewed the survey report for the Small-Boat Harbor Project (DACW-79-R-0032) at Geneva-on-the-Lake, Ohio. The report meets the "Specifications for Reports of Archaeological Services" of the Ohio Archaeological Council as approved by the Ohio Historic Site Preservation Advisory Board.

The results of the survey indicate that no prehistoric or early historic cultural resources are located within the project area and recommends that implementation of the undertaking proceed. Since no properties listed or eligible for listing on the National Register of Historic Places will be affected, I concur with the findings and recommendations.

This project is located within the landward extent of the coastal area as included within the drafts of Ohio's Coastal Zone Management Program and you may wish to submit a copy of the report for review and comments to:

Bruce E. McPherson, Administrator
Coastal Zone Management Program
Ohio Department of Natural Resources
Fountain Square, Building E
Columbus, Ohio 43224

The report submitted to this office will become part of the permanent record file to assist future researchers studying cultural resources in Northeastern Ohio. Thank you for requesting our comments on this phase of project planning.

Sincerely,

David L. Brook

David L. Brook
State Historic Preservation Officer

Incl 2

DLB:BCD:jjd
xc: Bruce E. McPherson

Regional Office: Cleveland Museum of Natural History
Wade Oval University Circle Cleveland, Ohio 44106 (216) 231-4600

January 31, 1980

Mr. Donald M. Liddell
Chief, Engineering Division
Department of the Army
Buffalo District, Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Dear Mr. Liddell,

I appreciate being given an opportunity to review the report entitled "Cultural Resources Reconnaissance Survey for Geneva-on-the-Lake Small Boat Harbor Project."

I concur with the findings of the report but offer one suggestion. I would recommend that the contractors for the job be informed of the potential (although slight) of unearthing archaeological resources during the initial construction phases of the project. If such discoveries are suspected, they can contact my office to make any salvage efforts.

Once again, thank you for forwarding your report to this office.

Sincerely,

David R. Bush
Regional Archaeological Preservationist

DRB/cc

Incl 3

Ohio Historic Preservation Office
Ohio Historical Center I-71 & 17th Avenue Columbus, Ohio 43211 (614) 466-5727

United States Department of the Interior
HERITAGE CONSERVATION AND RECREATION SERVICE
SOUTHEAST REGIONAL OFFICE
75 Spring Street S.W., Suite 1176
Atlanta, Georgia 30303

IN REPLY REFER TO:

W540
1201-02(a)

APR 10 1980

Mr. Donald M. Liddel
Chief, Engineering Division
Buffalo District, Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Dear Mr. Liddell:

Enclosed are our reviewer's comments concerning the report entitled "Cultural Resources Reconnaissance Survey for Geneva-on-the-Lake Small Boat Harbor Project."

We appreciate the opportunity to review the report.

Sincerely,

Stephanie H. Rodeffer

Stephanie H. Rodeffer
Acting Chief

Enclosure

UNITED STATES GOVERNMENT

memorandum

[illegible]

DATE: MAR 2 0 1988

REPLY TO ATTN OF: Archeologist, Interagency Archeological Services-Atlanta

SUBJECT: Review of the report entitled The Cultural Resources Reconnaissance Survey for Geneva-on-the-Lake Small - Boat Harbor project by Martin F. Murphy and Annette Silver

TO: Archeologist, IAS-Atlanta

This cultural resources reconnaissance report is, in my opinion, inadequate and does not fulfill the requirements of the Scope of Work. The report is very poorly written and needs a strong editorial hand. Background sections are brief and vague, and the discussion of field methodology does not provide a clear indication of what was actually done in the field. Maps included in the background and field methods section of the report need redrafting since they are in their majority blurry and uninformative. Specific comments pertaining to the various sections of the report are enumerated below.

Management summary - This should include a description of the work performed, its results, and any recommendations. Its purpose is to provide a useful tool for cultural resource management. The management summary presented in this report does not provide this information.

p. 5 - Project location and Description - Why the use of the term "irregular" to describe project area boundaries?

Environmental Setting - This section includes a discussion of project zones without first explaining what they are. The last line in this section is awkward and obscure. Maps reproduced here are very poor, and they lack a legend or explanation.

Fauna and Flora - This section should include a discussion of potential resources and their utilization by prehistoric groups. In the last sentence, the reference to "nearby areas" should be more specific.

Geological and Glacial History - This section could include a geologic map of the area and a more detailed discussion of glacial history. The discussion on shoreline erosion should be expanded to include rate of erosion and how it may have affected and affects the cultural resources of this area. The soils section is too brief and should be expanded to include a discussion of the relationship between different soil associations and the establishment of human settlements.

Prehistoric Overview Section - The section on the Paleo-Indian Stage should discuss the environmental changes rather than simply state that they occurred. The discussion of the archaic period could expand on the types of sites found in Ashtabula County, their location with respect to available resources, etc. The same comment applies to the discussion of Middle Woodland.

The field methods section should include a complete discussion of field techniques. On pages 26-27 mention is made of certain natural features of Zones I and III which could have been important for prehistoric and historic

settlement. These should have been discussed in detail in the background section of the report. Furthermore, shovel test intervals of 50 meters seem a little big to be of much use in locating sites.

Field methodology carried out in Zone II is not logical. If Zone II is fill from Period A, why would shovel tests be placed in what is obviously a disturbed deposit? In addition, 100 meter interval shovel tests wouldn't be very productive anyway. Lastly, what type of evidence for "developing hypotheses concerning the prehistoric and historic use of the general project area" could possibly be found from artifacts found in fill?

Karen Anderson Cordova

Karen Anderson Cordova

United States Department of the Interior

FISH AND WILDLIFE SERVICE

IN REPLY REFER TO:

East Lansing Area Office
Manly Miles Building, Room 202
1405 South Harrison Road
East Lansing, Michigan 48823

APR 3 [illegible]

Colonel George P. Johnson
District Engineer
U. S. Army Engineer District
Buffalo
1776 Niagara Street
Buffalo, New York 14207

Dear Colonel Johnson:

This is our report on the Four-Season Study, Geneva-on-the-Lake, Ashtabula County, Ohio. The study was undertaken to provide an ecological assessment of areas that could be impacted by the development of the Geneva-on-the-Lake Small Boat Harbor, now under study by the Army Corps of Engineers with the Ohio Department of Natural Resources as local cooperator.

These comments have been prepared under the authority of and in accordance with provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.) and in compliance with the intent of the National Environmental Policy Act of 1969.

Sincerely yours,

John Popowski
Area Manager

EXHIBIT G-2

FOUR-SEASON STUDY

GENEVA-ON-THE-LAKE

Ashtabula County, Ohio

Submitted to and funded by:

Buffalo District
U. S. Army, Corps of Engineers
Buffalo, New York

Prepared by:

Columbus Field Office
Division of Ecological Services
U. S. Fish and Wildlife Service
Columbus, Ohio

Released from:

East Lansing Area Office
U. S. Fish and Wildlife Service
East Lansing, Michigan

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INTRODUCTION

Project Description

The Four-Season Study, Geneva-on-the-Lake, was undertaken in an attempt to provide an assessment of fish and wildlife resources which might be impacted by the construction of a small boat harbor within Geneva State Park. The feasibility of constructing the harbor is presently being investigated by the Corps of Engineers, with the Ohio Department of Natural Resources as local cooperator.

A four-season, in-depth ecological assessment of the proposed harbor location and alternative sites was suggested in a planning aid letter of March 7, 1978, from the Fish and Wildlife Service's East Lansing, Michigan Area Office to the Buffalo District Corps of Engineers (CE). The need for such an assessment was reaffirmed by a preliminary field investigation of the project area by biologists from the Service's East Lansing, Michigan and Columbus, Ohio Field Offices during the week of April 3 - 7, 1978. The project area came under the jurisdiction of the Columbus Field Office in a Service realignment to state boundaries effective October 1, 1978. That office agreed to conduct the Four-Season Study under a funding agreement with the CE. The data included in this report are suitable for inclusion in the CE Reformulation Phase I General Design Memorandum Study as well as an Environmental Impact Statement if one is prepared. The study concentrated on the following communities listed in decreasing order reflecting the time expended on each: birds (particularly waterfowl), fish, vegetation, mammals, reptiles and amphibians, and benthos. Water levels were also monitored in the creeks and wetlands under study.

Project Area

The general project area is shown on Figure 1. The three major study areas are outlined in red. The present boundary of Geneva State Park is marked in orange. The marsh/swamp complex was the primary area under consideration as the site for the small boat harbor. The Cowles Creek area was studied as an alternative harbor site. At the suggestion of the Ohio Department of Natural Resources (DNR), the Wheeler Creek area was studied as a possible site for habitat improvement which might compensate for the loss of resources in the area impacted by harbor development. Data from sampling or observations outside the three major study areas were included in the study report when they concerned species that might also be found in one of the study areas.

Geneva State Park is located on the gently sloping lake plain in the extreme northwest corner of Ashtabula County. Hicks (1933a) described the area from just west of Wheeler Creek to just east of Cowles Creek as probably the best beach-dune area of the county. He further indicated that the water from the present marsh/swamp complex flowed into Cowles Creek before entering Lake Erie. He attributed the development of the Geneva-on-the-Lake marshes to the repeated

blocking of this stream complex by the shifting sand dunes. Just south of the marshes was a mature forest of oak-chestnut. The chestnut trees were already being afflicted by the chestnut blight (fungus) which in time essentially eliminated them from the eastern forests. In his bird surveys of Ashtabula County from 1925 to 1932, Hicks (1933a) noted that a number of species of breeding birds considered rare for the county were found breeding in the Geneva-on-the-Lake marshes, including the following species (total number of breeding pairs observed in county/number of that total that were found in marsh): pied-billed grebe (2/1), mallard (2/1), sora (2/1), common gallinule (2/1), American coot (1/1), and black tern (2/1).

By 1960 (U. S. Geological Survey topographic map, Geneva, Ohio 1960), water from the marsh/swamp complex no longer flowed into Cowles Creek, but flowed directly north into Lake Erie. An unimproved dirt road ran north from Lake Road to the sand dune complex between Cowles Creek and the marsh/swamp complex. Whether the connection to Cowles Creek had been severed by this road or had been severed earlier by natural processes is uncertain.

In the late 1960's the Ohio DNR began development of the bathhouse and parking lot between the present marsh/swamp complex and Cowles Creek. In the process, the large dune complex was eliminated along with a major portion of the original marsh area and some of the mature oak forest south of the marsh. The high lake levels experienced in the early to mid 1970's were also instrumental in reducing the size of the beach zone in the park area. The marsh area filled by the parking lot had been the site originally proposed by the CE for the development of the small boat harbor. The Ohio DNR now favors the development of the harbor in the remaining marsh/swamp complex.

METHODS

Vegetation

Vegetation cover maps were prepared for each of the three study areas. Aerial photos (ASCS 1972 1:2400 scale) were used to determine the boundaries of each zone. Boundaries were verified and characteristic vegetation was identified by ground surveys in June through September of 1979. Specimens of species that were uncommon or that could not be identified in the field were retained for further analysis. Identifications were made using the following keys: Fassett (1957), Peterson and McKenny (1968), Petrides (1972), and Weishaupt (1971). Nomenclature generally followed Weishaupt (1971). Identifications of several specimens were made or verified by Dr. Ronald L. Stuckey (Associate Professor, Ohio State University). Information on proposed state threatened or endangered species was supplied by the Natural Heritage Program, Division of Natural Areas and Preserves, Ohio DNR. Zones within the wetland portion of each study area were classified according to Shaw and Fredine (1956).

Fish

The fish communities of the three study areas were sampled by trap nets, seining, and electroshocking. Sampling was performed in April and October 1978 and March through August 1979. The trap nets used in 1978 had 1" sq. mesh bodies and 2" sq. mesh leads and wings. The bodies of the trap nets used in 1979 had ½" sq. mesh netting. From March 22, 1979 to April 17, 1979, the leads and wings were 2" sq. mesh netting. The larger netting allowed the nets to be set in the streams during heavy flow periods in the spring. After April 19, 1979, ½" sq. mesh netting was utilized for leads and wings. When set in the streams, the wings of the trap nets traversed the entire width of the stream, forming a "V" opening downstream. When placed in the borrow pits or marsh area, the body of the trap was at the waterward end of a lead running perpendicularly from shore. Wings were set at 45^{o} angles to the lead. Leads and wings were 6' deep and varied in length as required. A 100' x 6' x ¼" sq. mesh bag seine was utilized for sampling fish in the creek mouth pools and mixing zones just lakeward of the creeks. Electrofishing was performed using a small unpulsed DC backpack shocker, a Smith-Root Model VII backpack shocker with variable pulsed DC, or a large boat-mounted Coffelt VVP-15 shocker with variable pulsed DC.

All specimens captured were identified using Trautman (1957). Measurement of total length for each specimen was also performed if it could be done without unduly stressing the fish. The life or developmental stage (young-of-the-year, juvenile, or adult) was also recorded for most specimens. The determination was based on length of the specimen and not on scale readings or gonad examinations. Average total length for each species during each life stage is given in Trautman (1957). Total length measurements were not made, and all specimens were not enumerated when very large numbers of fish were collected such as occurred during night seining of the creek mouths. Voucher specimens of most species were retained for verification of species identification. Nomenclature follows Bailey (1970).

Benthos

During the preliminary survey on April 3-7, 1978, a limited number of samples were collected in the marsh/swamp complex. A 9" x 9" ponar dredge was used for collecting, and samples were sorted with a No. 30 sieve bucket. During the formal study, benthic organisms were collected only during the collection of aquatic vegetation and fish. Identifications were made using Pennak (1953).

Reptiles and Amphibians

The occurrence of snakes, frogs, and turtles was noted when they were observed or heard. Turtles were commonly caught in the trap nets. Salamanders were actively searched for on several occasions in the forest adjacent to the wooded swamp and in the Cowles Creek area. Identifications were made using Conant (1975).

Birds

Direct counts of waterfowl and other water birds were made from October 1978 through October 1979. In May 1979, the wetland was searched for nests. Waterfowl broods were noted when found, and recorded by species, age, and number of young. Other avian species were recorded when observed or heard. In addition, the numbers of breeding birds were estimated in the marsh/swamp complex and Cowles Creek area with the spot-mapping method (Williams 1936). Transects were placed on the northeast, east, and west sides of the marsh portion of the marsh/swamp complex, and along the west side of Cowles Creek. Transects were marked with flagging. Each transect was walked on four or five occasions during the early morning or evening and the species, sex, and location of each bird was recorded on a map. All observations of individual species were rerecorded on separate maps and estimates of breeding pairs were made through the grouping of the observations. Surveys for mourning doves and woodcock were also attempted. Bird identifications were verified using Peterson (1947) and/or Robbins, et al. (1966). All nomenclature has been updated through the Thirty-third supplement (Eisenmann 1976) to the American Ornithologist's Union Check-List of North American Birds (Wetmore 1957). A determination of the status (i.e. breeding, migrant, etc.) of each species was made based on the field survey data and the status of the species in Ohio (Trautman and Trautman 1968).

Mammals

Small mammals (mice, shrews, and chipmunks) were trapped with 3x3x9-inch Sherman live traps placed in the northeast portion of the marsh/swamp complex and along the west side of Cowles Creek. The marsh/swamp complex was trapped on three occasions, once a month in June, July, and August 1979 with 30 to 40 traps. The Cowles Creek area was trapped once during July and once in August with 25 and 15 traps, respectively. The occurrence of large mammals was noted through direct observations, tracks, scats, and dens. Animals were identified using Burt and Grossenheider (1976), and their tracks and scats were identified according to Murie (1975).

Water Levels

We installed water level gauges in each of the three study areas to determine the effects of littoral drift material blocking the creek mouths. Gauges were placed at the following locations on April 11 and 12, 1979 and removed December 20, 1979:

Marsh/swamp complex
1) near mouth
2) downstream of wooden pedestrian bridge
3) downstream of Lake Road

Cowles Creek
1) upstream of concrete pedestrian bridge
2) downstream of abandoned Lake Road bridge

Wheeler Creek
1) near mouth
2) upstream of Lake Road bridge.

Gauge readings were to be converted to elevations referenced to International Great Lakes Datum (1955) after a determination of the actual elevation of the zero point of each gauge had been made by a CE survey crew. However, the elevation data provided us by the CE for Cowles Creek and Wheeler Creek proved to be in error. An alternative method for determining the water elevations in these two study areas is explained in the results and discussion section. The condition of the creek mouth was noted when the water levels were recorded for each area. Corresponding water levels in Lake Erie were calculated from hourly and daily water level readings from Fairport Harbor (U. S. Department of Commerce, National Oceanic and Atmospheric Administration, National Ocean Survey, Rockville, Maryland). All elevations provided in this report are referenced to IGLD (1955).

For the days when the drainage was open, lake levels were calculated by averaging the hourly lake level reading corresponding to the time the gauges were read and the hourly lake level readings for one hour prior to and one hour after the gauge reading was taken. Averaging was employed in an attempt to reduce errors in lake level readings caused by short term water fluctuations at the Fairport gauge. For the days when the drainage was blocked, lake levels were calculated using the daily mean lake level at Fairport.

RESULTS AND DISCUSSION

Vegetation

Seventeen major habitat types or vegetation zones were differentiated within the three study areas (Table 1). When more than one distinct vegetative association or community could be identified within the same major vegetation zone, the distinct communities were differentiated by the use of capital letters following the numerical designation for the zone. Thus, within the shallow marsh (zone 3) several distinct communities could be identified: 3A - cattail, 3B - swamp loosestrife, 3C , 3D, and 3E - mixed emergents with no distinct dominants. The cover maps of the vegetation zones within the three study areas are presented in Figures 2, 3, and 4. Detailed lists of the plant species found within each zone are provided in Tables 2, 3, and 4. The plants are listed in the estimated order of dominance within each zone.

Marsh/swamp complex. The two large open bodies of water (zone 5) in the marsh/swamp complex are borrow pits that were created to supply material to build the bathhouse parking lot. The west borrow pit had maximum water depths of approximately 7.5 feet when surveyed on June 22, 1979. We found a large knoll within approximately one foot of the surface in the northwest quadrant of the pit. Except in the southeast and southwest corners, the sides of the pit have fairly steep

slopes. Apparently, the combination of the steep slope and exposed clay subsoil has limited the development of vegetation along the pit perimeter. A sparse band of cattail and sedges had colonized the lower section of the slope with young willows and grasses along the upper part. Only one long, shallow channel connects the west pit to the marsh which is located to the east of the pit. The channel runs NE from a point just south of the peninsula (zone 14).

The east borrow pit is not as deep as the west pit and has a more gentle slope along the perimeter of the south half of the pit. The water depths gradually increase from less than four feet in the south half of the pit to a maximum depth of approximately 5.5 feet in the northwest corner. A small island (zone 17) is found near the west edge of the pit. The perimeter of the pit, particularly along the south and east side, has a good border of Phragmites, cattail, rushes, and arrowhead. The west and northeast perimiter of the pit is steeper and the vegetative community of the dike (zone 14) comes almost to the water's edge, leaving room for only a limited transition zone of rushes. The island (zone 17) had a sparse covering of grasses and clover with some rushes along the perimeter. The east pit is connected to the marsh area by several short channels, the largest of which connects the southwest corner of the pit to the shrub swamp (zone 6). During the survey the east pit was generally much more turbid than the west pit and had less submerged vegetation.

A hardwood forest (zone 16A) borders the north, west, and south sides of the west pit and the south side of the east pit. Although the entire forest is included under zone 16A in Table 2, the portion of the forest west of a line running due north from Lake Road through the middle of the peninsula in the west pit is in a much younger successional stage than the forest east of that line. The western portion appeared to be in a shrub successional stage in 1966 (ASCS aerial photo, scale 1:2400). Presently the overstory consists of pole age cottonwoods, aspens, and ashes with some willows near the lake (see Fig. 5). If left undisturbed, the western forest portion at maturity should look very much like the eastern portion looks today. The eastern portion of the forest is more accurately described in the species list for zone 16A on Table 2. The mature trees in the overstory are 18 to 24 inches diameter at breast height (dbh).

The majority of the west borrow pit appears to have been excavated from the western portion of the forest zone. The east borrow pit was excavated in what appears to have been an extension of the eastern portion of the forest zone (1966 ASCS aerial photo, scale 1:2400). Exclusive of the two borrow pits and a portion of the dike (zone 14) between the shrub-swamp (zone 6) and the wet meadow (zone 2B), the majority of the marsh/swamp complex west of the parking lot does not appear to have been created or greatly modified by the building of the parking lot and bathhouse.

The wooded swamp (zone 7) is now dominated by an overstory of dead trees (Fig. 6). The trees appear to have died sometime between 1972 (ASCS aerial photo scale 1:2400) and 1978 (our preliminary survey). The extremely high water levels

experienced on Lake Erie in 1973 and 1974 may have contributed to their demise. The bottom of the swamp is level and is at an elevation of approximately 573 to 574 feet. The sides of the basin in which the swamp is found rise rather steeply to an elevation of 578 feet or higher. Trees on the slopes of the basin and in the forest surrounding the swamp still appear to be quite vigorous.

The water moving downstream through the wooded swamp is confined to a channel approximately 15 feet wide as it enters the shrub swamp (zone 6). Park personnel have constructed a small wooden pedestrian bridge across the channel. The major portion of the shrub swamp is a dense stand of buttonbush and ash (Fig. 7). Starting immediately north of the shrub swamp and continuing almost to the lake is the deep marsh (zone 4B) dominated by spatterdock with some patches of cattail (zone 4A) (Fig. 8). Along almost the entire periphery of the deep marsh zone is a shallow marsh zone dominated by cattail (zone 3A) and some patches of swamp loosestrife (zone 3B). Immediately north of the east borrow pit and separated from the major marsh portion that serves as a flow-way for the marsh creek, is another section of deep marsh (zone 4B). A large cattail stand occupying both deep and shallow marsh (zones 3A and 4A) lies immediately south of zone 4B. Southeast of this area is a pond-like area of spatterdock (zone 4B) and swamp loosestrife (zone 3B). The shallow marsh arm (zone 3C) extending to the northeast has developed a very lush and diverse emergent vegetation community (Table 2). A shallow channel connects the pond-like area to the cattail marsh (zone 3A + 4A).

The northeast corner of the marsh/swamp complex is a transition area from the marsh; through a wet meadow (zone 2A) of willows, grasses, and sedges; into an old field (zone 15A) dominated by pioneering trees and shrubs such as willows, cottonwoods, aspens, dogwoods, and sumacs. On the north edge of this zone and just east of the marsh mouth is a small stand of alder. Separating the old field (zone 15A) from the mowed grass (zone 11) is a fescue meadow (zone 13). The development of this fescue meadow may be the result of disturbance due to site preparation for the construction of the bathhouse.

<u>Cowles Creek Area.</u> The Cowles Creek open water (zone 5) consists of the main channel and the two creek branches that meet approximately 250 m upstream of Lake Erie (Fig. 3). The majority of the east bank rises rather steeply to an elevation of over 588 feet. The open woodland park (zone 16B) occupies this high ground. Very little aquatic vegetation has developed on the east bank of the main channel due to the steepness of the bank. Along the north bank of the east branch is a large area that was inundated during most of the survey period. The area was dominated by spatter-dock (zone 4C). The area between the two branches is covered by a hardwood forest (zone 16C) except on the narrow peninsula where the branches meet. The peninsula is covered with grasses and rushes.

The west bank of the main channel and west branch is very gently sloping and has a much more well developed wetland community than does the east bank. The shallow marsh (zone 3D) was normally inundated and had a diverse community of emergents (Table 3). Just south of the concrete pedestrian bridge that crosses the creek was a wooded area (zone 1) that was periodically inundated during times of

high creek levels. The slightly higher wooded area south of zone 1 was similar in dominant species to the forest between the two branches and was therefore included under zone 16C. Just west of the riparian woodland and forest was an area dominated by species typical of wet meadow situations. While this area is seldom inundated, the soils are probably saturated to within a few inches of the surface. The area was divided into three wet meadow zones based on dominant vegetative species (2C, 2D, and 2E on Table 3). Zone 2C may be the remains of what was once the channel connecting the unnamed marsh creek to Cowles Creek. During drier years, development of characteristic vegetation in zone 2C is reduced by mowing.

Wheeler Creek Area. As in the Cowles Creek area, the majority of the deep water habitat is confined to the open water (zone 5) of the creek channel. Development of submerged and floating-leaved vegetation is more extensive in the open water zone of Wheeler Creek than in that of Cowles Creek, with an area of very extensive development being separated into zone 4E. Most of the other areas of deep marsh (zone 4D) appear to be cutoff oxbows except for a small pocket of deep marsh in the most northeasterly corner of the Wheeler Creek wetland. The mowed grass (zone 11) to the north of the deep marsh pocket has a single line of trees along its north side where it meets the upper beach (zone 10). The other mowed grass areas to the east of the wetland are at an elevation of approximately 580 feet or higher. The transition to the wetland (elevation of 573 to 574 feet) is a rather precipitous bank that extends south to Lake Road. With the exception of the deep water zones, all of the basin north of Lake Road was typed as shallow marsh (zone 3E). Several times during the survey the entire basin was completely inundated and the vegetative community was typical of what one would expect in that situation. South of Lake Road, the area west of the creek sloped gently from the creek to an elevation of approximately 580 feet near Wheeler Creek Road. While this area would seldom be inundated, the moisture content of the soil was sufficient to support typical wet meadow species such as reed canary grass, bluejoint grass, and a number of species of Carex. Most of the area was typed as wet meadow (zone 2F) although upland species became more dominant as one approached Wheeler Creek Road. The area south of Lake Road and east of the creek sloped quickly to an elevation of approximately 590 feet. At the time of the survey, most of the area (zone 15B) was dominated by shrubs and trees. The area may be an abandoned pasture, with most of the shrub development beginning sometime between 1966 and 1972 (ASCS aerial photos). The woodland (zone 16D) that abuts Lake Road has also experienced tree and shrub development since 1966 but a number of the larger trees were present well before 1966. The section of zone 16D at the south edge of the study areas shows no tree or shrub development on the 1966 photo except immediately adjacent to the creek. Because the dominant new growth is willow and maple, the area was classified under 16D rather than 15B.

No plants on the proposed federal list of endangered and threatened species were found in the three study areas. During field surveys in 1975, 1977, and 1979, botanists from the Ohio DNR and Cleveland Museum of Natural History found nine species of plants appearing on the proposed state list of threatened and endangered plants (Table 5). During our survey we encountered two of the species, American water-milfoil and Nuttall's pondweed.

Fish

A total of 40 species of fish was collected in or upstream of the three study areas; 22 species in the marsh/swamp, 35 in Cowles Creek, and 23 in Wheeler Creek (Table 6). Scientific names are provided in Table 7. The marsh/swamp complex received the most sampling effort, followed by Cowles Creek and then Wheeler Creek (Tables 8, 9, and 10). Sampling with trap nets in Cowles Creek and Wheeler Creek was difficult in the spring due to high flows. Some species such as northern pike and various suckers may have ascended the creeks on spawning runs during these high flow periods and were not collected. We know that coho salmon and rainbow trout (steelhead) were caught by fishermen in Cowles Creek and Wheeler Creek during the spring of 1979, but we were unable to set nets to sample them. Seining was successful in the creek mouths later in the summer, but deeper water and numerous snags in the upstream reaches limited its use in those areas. The Coffelt electroshocker was fairly effective when used in Cowles Creek.

The adults of species such as trout-perch, white sucker, and spotted sucker were taken in the creeks in large numbers in the spring but few or no adults were found later in the summer (Tables 11, 12, and 13). Some species such as spottail shiner, sand shiner, longnose dace, and logperch were taken primarily over the sand and gravel substrate associated with the creek mouths and were seldom or never found in the upstream areas. Other species such as stonecat, white bass, and freshwater drum were captured almost exclusively in the shallow mixing zones just lakeward of the stream mouths.

Sixteen species reported by Trautman (1957) in the study areas or in adjacent streams were not collected during the Four-Season Study. These species include bowfin, northern pike, blacknose dace, redfin shiner, spotfin shiner, mimic shiner, channel catfish, tadpole madtom, rock bass, smallmouth bass, and warmouth. Northern pike spawn at night just at or after ice-out and usually return to the lake shortly thereafter. In several nights of trap netting just at ice-out in both 1978 and 1979 in the marsh/swamp complex, no northern pike were captured. Smallmouth bass and rock bass would only be found in very low numbers in the study areas because the gravel/boulder substrate and moderate gradients they prefer are not present in the lower reaches of the study creeks.

Eleven species were found during the Four-Season Study that were not reported by Trautman (1957). These species include American brook lamprey, coho salmon, rainbow trout (steelhead), central mudminnow, quillback, spotted sucker, white crappie, and black crappie. American brook lampreys are short-lived as adults and are easily missed if surveys do not coincide with their spawning period in late April. Coho salmon and rainbow trout are present as the result of local stockings initiated by the Ohio DNR after Trautman's surveys. The majority of the adult quillbacks and spotted suckers are present in the streams only during spawning runs. White and black crappies are typically found in the pond-like environments in the study areas and are more widespread today than during Trautman's surveys.

The fish community of the marsh/swamp complex is typical of what one might expect in an area that is more often pond-like than free-flowing. Gizzard shad, golden and emerald shiners, bullheads, carp, and five species of centrarchids dominated the community. Few of the fish we collected were of catchable size. The low water levels we observed when the marsh mouth was completely open to the lake may place a major stress on the fish community. The two borrow pits provide some refuge because the depths of the connecting channels limit the degree to which the pits can be drained.

Cowles Creek and Wheeler Creek appeared to support the majority of sport fishing in the park. Most of the effort was directed toward the spring and fall runs of coho salmon and steelhead. Some fishermen also dipped smelt during the spring spawning run. The limited fishing we observed the rest of the year did not appear to be directed toward any specific species.

No federally listed endangered or threatened fish species were found. At the Geneva State Park office we examined a number of American brook lampreys, a state endangered species, that had been taken from Wheeler Creek near U. S. Route 20 by a local fisherman on April 24, 1979. All brook lampreys have two specific habitat requirements; high gradient riffles for spawning adults and lower gradient areas with bars of mixed sand and organic debris for ammocoete development. The upper half of Wheeler Creek provides the high gradient habitat required. The lower part of the creek is apparently still providing relatively clean bars of sand and organic debris. Whether ammocoetes utilize any of the creek within the study area is unknown.

Benthos

While no quantitative survey of the benthic community was attempted, the following organisms were collected in the marsh/swamp complex during the limited preliminary survey and during the collection of vegetation and fish: leeches, isopods, amphipods, crayfish, damselfly larvae, dragonfly larvae, water scorpions, alderfly larvae, midge larvae, and one adult bivalve mollusk (Anodonta grandis). The shallowness of most of the water area, the large amount of organic debris on the bottom, and the lush and diverse development of aquatic vegetation should all lead to the development of a substantial benthic community. The sudden fluctuations in water level produced by the alternating pattern of opening and closing of the marsh mouth would appear to be the only factor that could limit maximum benthic development. Some long-lived species such as the crayfish, the bivalve mollusk, and the alderfly larvae are surviving these fluctuations.

Reptiles and Amphibians

Nixon et al. (Ohio DNR) listed 17 amphibian and 19 reptile species, including one species of lizard, whose ranges included the project area. During the Four-Season Study, we encountered six species of amphibians and five reptile species (Table 14).

Of the 11 salamander species native to the area, two were found. Six red-backed salamanders and one spotted salamander were found in the upland hardwood forest (zone 16A) adjacent to the wooded swamp (zone 7). All specimens were found in or under large rotting logs.

The green frog and the American toad were the most common anurans in the study area. American toads were commonly found in the wet meadow (zone 2A) and old field habitat (zone 15A) north of the marsh. The green frog was often heard and seen along most shorelines of the marsh, borrow pits, and creeks. The bullfrog was heard on only one occasion in the marsh. The leopard frog was commonly heard or seen in the three study areas only during the breeding season in the spring.

The midland painted turtle and the snapping turtle were the only turtle species caught out of a possible four species. The midland painted turtle was commonly caught in trap nets set in all the creeks, the marsh and swamp, and borrow pits. Fourteen painted turtles were caught in one overnight set on Wheeler Creek and thirteen in an overnight set at the wooden pedestrian bridge in the shrub swamp (zone 6). They were often observed in large numbers sunning themselves on fallen trees in all three study areas. The Blanding's turtle was observed only once, in the early spring in the marsh. The snapping turtle was common but was found only in the marsh/swamp, and the adjacent borrow pits. In all of the trap net sets in the marsh/swamp complex, a total of five snapping turtles were captured.

Only the two most common snakes in the region, the eastern garter snake, and the northern water snake were found. The eastern garter snake was commonly observed in the spring in the meadow and old field habitats of the three study areas. The northern water snake, an aquatic species, inhabits marsh and creek habitat. They were particularly numerous in the stream mouths at night, feeding on the juvenile fish that were abundant in the shallow mixing zones. Several also were found adjacent to the marsh. No endangered or threatened species were observed during the study. However, the spotted turtle, a state endangered species, may occur in the project area since it has been reported several times in the Geneva area.

Birds

A large number of avian species inhabit the park during the course of a year due to the high diversity and interspersion of habitats (beach, lake, creek, marsh, swamp, old field, meadow, upland, and bottomland hardwood forest) in the park. Robbins et al. (1966) documents 224 migratory and breeding avian species which could potentially use the area. We observed a total of 94 species in the park; 86 in the marsh/swamp complex, 56 in the Cowles Creek area, and 27 in the Wheeler Creek area (Table 15). The low number of species observed at Wheeler Creek reflects a lesser amount of observation time and a lower diversity of habitat types than were found in the other two study areas. The high number of species utilizing the marsh/swamp complex was a direct result of the excellent diversity of habitats in that area.

No federally listed threatened or endangered bird species were observed during the study. The sharp-shinned hawk, a state endangered species, was often observed hunting in all three study areas during spring migration. During fall migration the species was only observed once, in the wooded swamp. The species was not seen during the nesting season.

Of the 94 species found in the park, 46 were breeding or could be expected to breed in the park (Table 15). Hicks (1933b) recorded 154 species as breeding species in Ashtabula County. Fewer than 105 of those species could presently be considered as more than accidental or very rare breeders in northeastern Ohio (Trautman and Trautman 1968). A total of 31 breeding species were found during the study; 26 in the marsh/swamp complex (Table 16) and 21 in the Cowles Creek area (Table 17).

In the marsh/swamp complex the tree swallow, barn swallow, and red-winged blackbird were the most abundant breeding species followed closely by the yellow warbler, common yellowthroat, gray catbird, and song sparrow. The red-winged blackbird nested in the emergent marsh vegetation and adjacent willow stands. The yellow warbler, common yellowthroat, and song sparrow were attracted to the mid-successional old field habitat of dogwood, willow, and raspberry north of the marsh and along the dikes in the wetland. The gray catbird preferred the forest edge along the west and south extremes of the wetland. Killdeer and spotted sandpiper utilized the sparsely vegetated island in the east borrow pit.

In the Cowles Creek area the barn swallow, tree swallow, and purple martin were the most abundant breeding species followed by the red-winged blackbird, yellow warbler, and song sparrow. The latter three species were attracted to the lush growth of wetsoil plants, shrubs, and snags in the Cowles Creek area. A belted kingfisher nested in the steep clay bluff on the east side of the Cowles Creek mouth. The large number of dead trees along Cowles Creek, around the marsh, and in the swamp attracted a variety of cavity nesting species such as the red-headed woodpecker, common flicker, great crested flycatcher, white-breasted nuthatch, downy woodpecker, purple martin, and tree swallow. The barn swallow nested in the new bathhouse and in the old bathhouses on the east edge of the Cowles Creek area.

On the few occasions in late April and early May when we attempted woodcock surveys and in early May when we attempted dove surveys, weather conditions did not meet official survey recommendations. However, we did hear two woodcock in the picnic areas just south of the bathhouse parking lot. We also heard one in the wet meadow (zone 2C) of the Cowles Creek area and (zone 2A) of the marsh/swamp complex. We located one dove on the north edge of the Wheeler Creek area and two on the south edge. None were heard or seen in the marsh/swamp complex or in the Cowles Creek area during the dove surveys. However, doves were observed during other routine bird surveys in both areas.

Waterfowl production associated with the marsh/swamp complex and Cowles Creek was impressive when the small size of the wetland and adjacent suitable stream habitat are considered. Two wood duck broods, one mallard brood, and one Canada

goose nest were found on the marsh/swamp complex (Table18). Two wood duck and one mallard brood were found on Cowles Creek and one wood duck brood was seen on Wheeler Creek. Wood duck production in Ashtabula County is apparently very good. Information from the Ohio DNR indicates that at least nine streams in Ashtabula County contain important wood duck habitat. However, none of the streams appear to be censused regularly for wood duck production.

All of the broods observed were found after July 4th, and all were less than 30 days old. Nest initiation dates ranged from May 2 - June 10. Bellrose (1976) documented peak wood duck nesting initiation dates for central Illinois as April 17 through May 2 with the last nests initiated no later than June 25. The mallard nest initiation peak is May 5 - May 30.

Several factors may account for our inability to find broods earlier than July 4th. One factor may be that the broods were younger and more vulnerable to predation and thus may have been more secretive. The broods observed were from nests initiated later than average. Therefore, we may have missed broods from earlier nests. From 45 to 60% of wood duck nests and about 45-75% of mallard nests fail to hatch (Bellrose 1976). Thus, some broods we observed may have been the result of a second nesting effort by the hen. The difficulty in finding broods due to the dense vegetation in the wetland probably prevented our finding more than one-half of the broods.

Two pair of Canada geese utilized the wetland area during the spring of 1979. On May 24th, a goose nest with five eggs was found on a muskrat lodge in the cattail marsh (zone 3A + 4A) on the northeast corner of the marsh/swamp complex. Four of the five eggs hatched between May 30 and June 6, but the adults and brood were not seen again. Geese reportedly have nested in the park area for several years and presumably are a part of a flock of about 3,000 individuals established by the Ohio DNR at Mosquito Creek Reservoir State Wildlife Area, approximately 40 miles SSE of the project area.

Several factors contribute to the value of the park as a waterfowl production area. First, the wetland and neighboring streams must be considered as a complex, each part of which contributes to the whole. Nesting waterfowl, including wood ducks, require a variety of wetland or creek habitat to fulfill their needs. For a protein source, laying hens feed extensively on invertebrates which are readily available in shallow wetlands (less than 30 cm deep). More than 50% of the invertebrates consumed are aquatic invertebrates (Drobney and Fredrickson 1979). A deep marsh with open water interspersed with emergent vegetation produces the maximum invertebrate biomass (Voigts 1973). Open water for courtship and loafing are also needed. The marsh/swamp complex provides the best combination of habitat types for the activities mentioned above of the three areas studied.

Wood ducks nest in tree cavities and are often limited by the availability of suitable size cavities. Gilmer et al. (1978) located active wood duck nest cavities by radio tracking hens to the nest. Most nests were within 0.5 km of permanent

water. The species of tree is unimportant, although sugar maple, basswood, American beech, and elm appear to contain more cavities than do most other tree species. Upon hatching, the wood duck young are led to water and require sufficient cover for protection. The young ducklings also feed extensively on invertebrates as a protein source for growth. Again, aquatic emergent vegetation interspersed with open water provides the best habitat for both requirements.

Ball et al. (1975) studied wood duck brood survival and surmised that mortality was directly related to the distance of overland travel. He recommended encouraging nesting within 0.8 km of water. Geneva State Park contains an abundance of upland and bottomland hardwood forest in close proximity to creeks and wetlands. The marsh/swamp complex provides valuable early spring feeding areas for laying hens and an abundance of cover and food resources for broods. In addition, the wetland provides optimum habitat for breeding mallards and Canada geese. Cattail marsh, wet and upland meadows, and dikes provide suitable nesting habitat for mallards and Canada geese within or near the wetland.

A total of eighteen species of waterfowl, five species of herons and bitterns, two species each of grebes and gulls, three species of marsh birds (rails, coots, and gallinules), and one species of loon were observed utilizing one or more of the study areas (Tables 19 and 20). Shallow-wading species such as woodcock, killdeer, and sandpipers were not included. A number of species such as common merganser, snow goose, whistling swan, and herring gull were observed offshore of the study areas but were not included on these tables or on Table 15.

Ashtabula County lies within a major flight path extending from the Atlantic coast through the western basin of Lake Erie and into the prairie nesting area and beyond. Water birds began appearing in the study areas immediately after ice-out in early March. Large numbers of mergansers and scaup concentrated offshore in the lake in late March and early April. Only a small number of the birds utilized the study areas.

The majority of the water bird use in Cowles Creek and Wheeler Creek during the spring consisted of red-breasted mergansers and horned grebes foraging on shiners and other small fish that were ascending the creeks. Hooded mergansers and buffleheads were seen feeding on shad and shiners in the borrow pits in mid-March. However, the majority of the spring use in the marsh/swamp complex was by dabbling ducks. The complex not only served as a resting area but also provided an important shelter for water-birds during severe weather conditions. For example, on the night of April 5, 1979, during the peak of the spring migration, northeast winds of over 40 knots swept the lake. On the next morning, 79 waterfowl of nine species and 285 gulls of two species were observed resting on the marsh and borrow pits. By mid-May only the breeding waterfowl and some transient or non-breeding members of species such as great blue heron and ring-billed gull remained in the study areas.

Although waterfowl use in the swamp/marsh complex was extensive and diversified in the spring, the greatest use occurred as wood ducks concentrated in the area prior to fall migration. We first noted an increase in wood duck use in the second week of August. From August 23, 1979 through October 4, 1979 the number of wood ducks varied from 115 to 182 per evening survey. A conservative estimate of the total use of the area from August through October for wood duck night roosting would be 8000 waterfowl use days. There was also a moderate amount of fall use by Canada geese, mallards, and blue-winged teal. However, the number of waterfowl species using the area was much lower in the fall than in the spring.

As most of the birds were using the area as a night roost, we made our counts by concealing ourselves in a good vantage point on the edge of the marsh approximately one hour before sunset and counting all waterfowl that landed in the area until darkness prevented our seeing anymore birds. We attempted to verify our counts by returning to the area before dawn the following mornings to count the birds as they left the area. Such attempts were unsuccessful as many of the wood ducks left when only the faintest light brightened the sky. Therefore, only the evening observations (E) on Table 19 for August, September, and October accurately reflect the number of wood ducks using the area.

A number of the birds leaving the area each morning were observed moving to Cowles Creek. As in other parts of the park, oak trees in the Cowles Creek area provide the mast favored by wood ducks as a fall food.

In both 1978 and 1979, the numbers of wood ducks using the area decreased about a week before the opening of the waterfowl hunting season (October 19, 1978 and October 15, 1979). Work done on other wood duck roosts by Tolle (1973) indicates that this decrease could be normal dispersion or it could be the result of disturbances such as the building of duck blinds associated with the opening of the waterfowl hunting season. The use of the area by wood ducks and other waterfowl was quite low after the start of the hunting season. Thirteen hunters were observed along the marsh perimeter on opening day of the 1978 season.

Gilmer et al. (1977) studied post breeding activities of wood ducks in Minnesota and found that 17% of the drakes and 42% of the hens that bred locally remained in the same area until the hunting season began. During the flightless period, 59% of the drakes and 48% of the hens remained in the local area. In an Illinois study, some wood ducks regained flight by early August but others were still flightless as late as September 29 (Bellrose 1976). During the flightless period, wood ducks remained in areas with abundant emergent cover (Gilmer et al. 1977). Therefore, the wetland complex may have provided cover for a large number of flightless ducks which were not seen. Parr et al. (1979) studied autumn wood duck movements in Illinois and showed that the ducks stay within 2.2 km of the roost.

As in the study by Tolle (1973), the wood ducks we observed showed a decided preference for buttonbush cover for night roosting. We often observed wood ducks landing in the floating-leaved zone of the marsh or in the east borrow pit, but the birds would then swim into the shrub swamp zone. On several occasions when two

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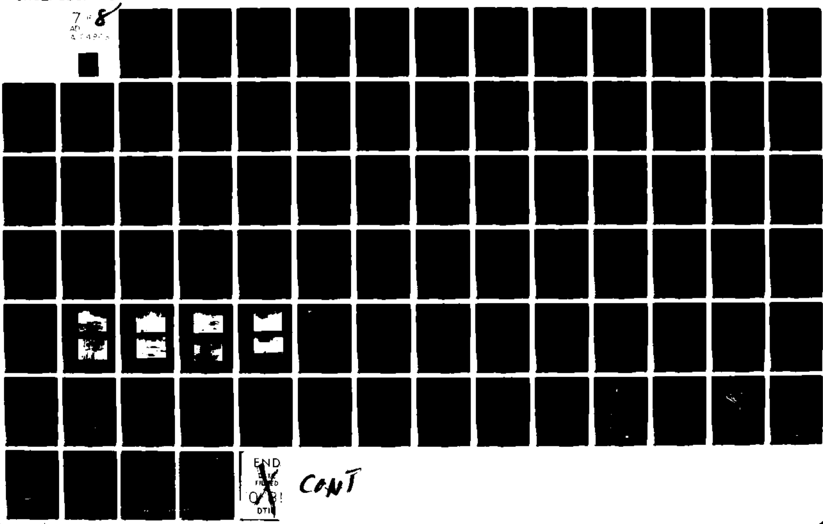

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observers were available, one would be positioned to view the shrub swamp while the other would view the wooded swamp and/or the marsh mouth area. The number of birds using the shrub swamp was always at least ten times greater than the number using the other habitat(s).

Mammals

Of the 48 species of mammals whose ranges include the project area (Burt and Grossenheider 1976), we found evidence indicating that at least 16 of the species utilized one or more of the study areas (Table 21). Most species not found were those that are difficult to trap and leave few visible signs; such as the moles, small shrews, bats, weasels, and flying squirrels, or those species for which no habitat was available such as the pine vole. No endangered or rare species were found.

Bats were not sampled during the study although several individuals of an unknown species were observed in the marsh area. The little brown bat, big brown bat, and eastern pipistrel are the most common species in Ohio and probably comprise the majority of the individuals seen in the early evening. Burt and Grossenheider (1976) list ten species of bats which may occur in the area, including the Indiana bat, a federally endangered species. The Indiana bat prefers riparian habitat of medium size streams with closed or semi-open canopy (Dennis Case, Ohio DNR, pers. comm). Cowles Creek and upper Wheeler Creek may provide such habitat.

Five species of small mammals were captured north of the marsh with Sherman live traps and four species were captured along Cowles Creek (Table 22). Trapping success was 13.6% of 176 trap-nights (1 trap set for 1 night) in the marsh/swamp complex and 30.2% of 43 trap-nights along Cowles Creek. This indicates a slightly greater abundance of small mammals at Cowles Creek, probably due to the lush vegetation and greater amount of snags, logs and dense undergrowth. As expected, the white-footed mouse was the most abundant species at Cowles Creek comprising 53% of the catch. White-footed mice prefer open woodlands and hardwood riparian habitats with an abundance of snags and logs.

North of the marsh, the shorttail shrew was the most abundant (58% of catch) followed by the meadow vole (26%). The shorttail shrew, which feeds on insects, prefers a variety of habitats and would be expected to be abundant in an old field with a diversity of microhabitats such as in the area north of the marsh. Grasshoppers were abundant during the summer and would tend to attract shrews. The meadow vole is restricted to old fields and grasslands. The populations of this species fluctuate drastically from year to year and may become very high in some years. During several winter visits, a large number of air holes and push-ups created by meadow voles in the snow were found in the old field and meadows north of the marsh. We found evidence of an attempt by a raptor to catch a meadow vole at an air hole on the east side of the meadow (zone 13). Several hawks were also observed hunting in this area during the spring and fall. Meadow voles are an important food source for foxes, hawks, owls, skunks, and weasels.

Several fox and red squirrels were observed in the study area. Although neither was commonly seen, the fox squirrel was most common in the picnic area east of Cowles Creek. The large number of hickory and oak trees along the east bank of

Cowles Creek and in the woods adjacent to the swamp should provide excellent squirrel habitat, but squirrels were rarely seen in these areas. Perhaps overhunting has occurred, or some other disturbance has suppressed the population.

The population of rabbits (eastern cottontail) was low for an area with such a diversity of habitats. During the winter visits we observed very few tracks except in a hawthorn thicket in the southeast corner of the hardwood forest (zone 16A) and in a large tangle of grape vines west of the marsh creek mouth. The severe winters of 1977/78 and 1978/79 may have led to a temporary decrease in the population size.

Whitetail deer tracks and signs were common in the marsh area and in the forest (zone 16A). A doe was flushed from the northern edge of the marsh in May. The old field habitat north of the marsh, with the diversity of shrubs and grasses, provides abundant browse and bedding sites for deer.

The raccoon is by far the most abundant carnivore. Tracks were numerous along the edges of the marsh, swamp, and creeks of the three study areas. Raccoon generally travel traditional corridors during hunting, with males having a home range of about one mile in diameter and females 3/4 mile (Schwartz and Schwartz 1959). Therefore, more than one animal may traverse the entire study area. Den sites are usually hollow trees but may also include muskrat lodges (Urban 1968). The number of dead trees along Cowles Creek and in the swamp probably provide abundant denning sites. Raccoons are important predators on ground nesting ducks, and wood duck nests.

The red fox was probably the next most abundant species of carnivore. No dens were found, but tracks indicate the area is traversed often by hunting individuals. Several sets of mink tracks were found around the marsh and swamp perimeter during the winter visits.

Fresh beaver cuttings were found along Cowles Creek and on a dike (zone 14) between the marsh and the east borrow pit. The activity at Cowles Creek included a recently accumulated stockpile of saplings indicating a family group may be present rather than an isolated individual. Beaver in Ohio and the midwest commonly den in banks along streams. The natural damming effect of the lake on Cowles Creek may make the lower stretches of that stream attractive to beaver.

Muskrats were commonly seen in the spring and fall but less so in the summer. Only two lodges existed in the marsh during the spring of 1979, indicating most animals denned in dikes and banks. Severe water level fluctuations in the spring and fall and low water levels in the winter could be detrimental to muskrat populations in the wetland. Several trappers that were interviewed stated they had greater success in the borrow pits and streams (Cowles and Wheeler Creeks) than in the wetland (marsh/swamp complex exclusive of pits).

Water Levels

As indicated in the methods section, the actual elevation of water levels (referenced to IGLD, 1955) in the three study areas was to be calculated by adding the readings from the water level gauges to the elevation of the zero point of the gauge. The actual zero point elevation was to be determined by a survey done in the fall of 1979 by personnel from the Buffalo Corps. Upon receiving the zero point elevation data and performing the previously described calculations, it was discovered that the calculated surface elevations for Wheeler Creek were 1.5 to 2 feet lower than the elevations of the lake as indicated by the water level elevations for Fairport Harbor. We attempted to discover the source of any possible errors but were unsuccessful.

We then developed an alternative strategy to determine the elevation of the zero points of the gauges. One could closely approximate the actual elevation of a point on a water level gauge if the following conditions could be met: 1) the gauge was located in the lower section of a creek at or near base gradient; 2) the creek mouth was wide open to the lake; 3) the flow rate of the creek was relatively low; 4) the lake was relatively calm and stable; and 5) one knew the elevation of the surface of the lake at the time one was reading the water level gauge. Examining our field notes, we were able to find water level gauge readings that were taken at times when these five conditions could be met. The elevations of the zero points of the gauges calculated by this second strategy when compared to the elevations supplied by the survey crew differed by the following amounts: Wheeler Creek, +1.80 feet; Cowles creek, +0.22 feet; marsh/swamp complex, no appreciable difference. Recalculating the water levels in Cowles Creek and Wheeler Creek using zero point elevations determined by the second strategy gave results that agreed much more closely with water elevation differentials between the lake and creeks that had been visually estimated during field surveys. The recalculated water levels are used in this report.

An additional problem was the washing out of the gauges at the mouth of the three creeks. The Cowles Creek gauge was lost in early June, the Wheeler Creek gauge in late August, and the marsh creek gauge in mid-October. Prior to this, we had taken a sufficient number of readings at all gauges to reach the following conclusions: 1) the water elevation in Cowles Creek at the mouth gauge was similar to the water elevation at the upstream gauge during low flow conditions and when the mouth was closed or almost closed; 2) the water elevations at the mouth gauges of Wheeler Creek and the marsh creek were almost always identical to the water elevations at the next gauge upstream when the creek mouths were closed.

The surface water elevations for the three study areas and the corresponding lake elevations are presented in Tables 23, 24, and 25. Only the water elevations at the upstream gauge are provided for Cowles Creek and Wheeler Creek. Water levels in the marsh varied from 572.15 feet on April 26 when the creek mouth was open to 574.21 feet on October 29 when the mouth was closed. Water level fluctuations were not quite as extreme on Cowles Creek or Wheeler Creek. The minimum and

maximum water levels recorded were 572.08 feet (mouth open) and 573.90 feet (mouth closed) on Cowles Creek and 571.97 feet (condition of mouth not recorded, but probably open) and 574.07 feet (mouth closed) on Wheeler Creek.

The water level fluctuations in all three study areas are the result of two interacting forces; 1) the flow rates of the creeks, and 2)the transport and deposition of littoral drift material in the creek mouths due to the wave energy of the lake. If one assumes that littoral transport is fairly uniform along the Geneva State Park lake shore with the exception of some interference due to a concrete groin west of Wheeler Creek, the major variable affecting the condition of each creek mouth would appear to be the flow rate of the creek. This appears to be the case as Cowles Creek, which has the largest drainage basin, experienced the fewest number of days when the mouth was closed by a littorally deposited bar. The marsh creek, with the smallest drainage basin, experienced the highest number of days when the mouth was closed. Even on many of the days when the condition of the creek mouths were indicated as open, the water levels in the study areas remained above the prevailing lake level as the bars at the mouths were not completely blown out but rather were functioning as low-head dams, allowing only a small flow to cascade down them to the lake. This was particularly true in the summer and fall. High flows in late winter and early spring initially opened very wide and deep mouths at Cowles Creek and Wheeler Creek. As flow rates decreased, littoral drift material gradually filled these deep cuts, resulting in mouths that even when open were often quite shallow and riffle-like.

Some of the highest water levels in the marsh/swamp complex were the result of storms that produced very strong onshore winds and some precipitation. The resulting water levels were sufficient to completely inundate the shallow marsh (zone 3C) and approximately 30 m of mowed grass along the northwest edge of the parking lot. The static pool reached upstream beyond the Lake Road culvert.

Fig. 5 illustrates the typical summer condition of the marsh creek mouth. Figs. 9 and 10 illustrate the difference between marsh water levels when the mouth is open (Fig. 9) and when the mouth is closed (Fig. 10). Figs. 11 and 12 illustrate the importance of the marsh creek blockage to the development of the northeast portion of the complex. There is very little water in the floating-leaved deep marsh channel (zone 4B between zone 2A and zone 3A + 4A) when the marsh creek mouth is open. When the mouth is closed (Fig. 12) the water is deep enough to prevent most emergent growth. As the elevations of the littorally deposited bars are a function of wave height and lake level, one could generally expect changes in the average water levels in all three study areas to parallel long-term changes in lake level.

Changes in water levels in a wetland are essential to the maintenance of aquatic vegetation. Periodic reductions in water levels and the drying out of the wetland substrate serves to oxidize organic material, allow germination of aquatic plants, and increase productivity (Weller and Spatcher 1965, Weller and Fredrickson 1974). Likewise, high water levels (2-3 feet) thin the vegetation and create openings, edges, and water conditions necessary for maximum wildlife use (Weller and Fredrickson 1974).

The low water levels in the marsh/swamp complex in the spring may reduce waterfowl production of the area. Shroeder et al. (1976) regulated spring water levels on control and experimental marsh units in Colorado and found higher waterfowl production in areas flooded prior to migration. Higher water levels in prairie wetlands in Iowa created more loafing and feeding sites for territorial pairs and increased the number of blue-winged teal breeding pairs (Weller 1979). Without the constant redeposition of littoral drift material in the mouth of the marsh creek; the size, diversity of habitat types, and waterfowl use of the wetland would be substantially reduced.

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Table 1. Vegetation zones of the marsh/swamp complex, the Cowles Creek area, and the Wheeler Creek area delineated during the Four-Season Study, Geneva-on-the-Lake.*

Cover maps of the three study areas are presented in Figures 2, 3, and 4; and species lists for each zone are provided in Tables 2, 3, and 4.

General Vegetation Zones	Marsh/Swamp	Cowles Creek	Wheeler Creek
Periodically flooded woodland		1	
Wet meadow	2A, 2B	2C, 2D, 2E	2F
Shallow marsh	3A, 3B, 3C	3D	3E
Deep marsh	4A, 4B	4C	4D, 4E
Open water	5	5	5
Shrub swamp	6		
Wooded swamp	7		
Beach	10	10	10
Mowed grass	11	11	11
Pasture			12
Meadow	13		
Dike	14		
Old field	15A		15B
Woodland or forest	16A	16B, 16C	16D
Island	17		

* The vegetation zones designated by single digit numbers correspond to the wetland types described in Fish and Wildlife Circular 39, Wetlands of the United States. The double digit numbers for the non-wetland zones were arbitrarily selected for the purpose of this report only. When several distinct vegetative communities occur within the same general vegetation zone or wetland type, they are differentiated by the use of capital letters.

Table 2. Plant species found within the vegetation zones of the marsh/swamp complex during the Four-Season Study, Geneva-on-the-Lake.

See Fig. 2.

2A. Wet Meadow	
Black willow	*Salix nigra**
Phragmites	*Phragmites communis*
Bluejoint grass	*Calamagrostis canadensis*
Fox sedge	*Carex vulpinoidea*
Sedge	*Carex* sp.
Sedge	*Carex lupulina*
2B. Phragmites Wet Meadow	
Phragmites	
Red-osier dogwood	*Cornus stolonifera*
3A. Cattail Shallow Marsh	
Narrow-leaved cattail	*Typha angustifolia*
Bladderwort	*Utricularia vulgaris*
Lesser duckweed	*Lemna minor*
3B. Loosestrife Shallow Marsh	
Swamp loosestrife	*Decadon verticillatus*
3C. Emergent Shallow Marsh	
Softstem bulrush	*Scirpus validus*
Giant bur-reed	*Sparganium eurycarpum*
Narrow-leaved cattail	–
Wool-rush	*Scirpus cyperinus*
Broadleaf arrow-head	*Sagittaria latifolia*
Blunt spike-rush	*Eleocharis obtusa*
Phragmites	
Rice cutgrass	*Leersia oryzoides*
Rose-mallow	*Hibiscus palustris*
Dark green bulrush	*Scirpus atrovirens*
Common threesquare	*Scirpus americanus*
Swamp milkweed	*Asclepias incarnata*
4A. Cattail Deep Marsh	
(see 3A. for species composition)	
4B. Floating-Leaved Deep Marsh	
Spatter-dock	*Nuphar advena*
Bladderwort	
American water-milfoil	*Myriophyllum exalbescens*

Table 2. (Continued)

5.	Open Water	
	Crisp-leaf pondweed	*Potamogeton crispus*
	Sago pondweed	*Potamogeton pectinatus*
	American water-milfoil	
6.	Shrub Swamp	
	Buttonbush	*Cephalanthus occidentalis*
	Ash	*Fraxinus* sp.
	Dead trees	
	Spatter-dock	
	Pickerel-weed	*Pontederia cordata*
	Bladderwort	
	Narrow-leaved cattail	
	Phragmites	
	Broadleaf arrow-head	
	Wool-rush	
	Nuttall's pondweed	*Potamogeton epihydrus*
	Mild water-pepper	*Polygonum hydropiperoides*
	Softstem bulrush	
	Sedge	
7.	Wooded Swamp	
	Dead trees	
	Buttonbush	
	Lizard's tail	*Saururus cernuus*
	Arrow-leaved tearthumb	*Polygonum sagittatum*
	Nodding smartweed	*Polygonum lapathifolium*
	Dotted smartweed	*Polygonum punctatum*
	Pennsylvania smartweed	*Polygonum pensylvanicum*
	Jewel-weed	*Impatiens capensis*
10.	Beach	
11.	Mowed Grass	
13.	Meadow	
	Meadow fescue	*Festuca elatior*
14.	Dike	
	Red-osier dogwood	
	Staghorn sumac	*Rhus typhina*
	Eastern cottonwood	*Populas deltoides*
	Black willow	

Table 2. (Continued)

14. Dike (continued)

Willow	_Salix_ sp
Phragmites	
Fescue	_Festuca_ sp.
Jewel-weed	
Goldenrod	_Solidago_ sp.
Queen Anne's lace	_Daucus carota_
Wild rose	_Rosa_ sp.
Yellow sweet clover	_Melilotus officinalis_
Timothy	_Phleum pratense_
Dogbane	_Apocynum_ sp.
Canada goldenrod	_Solidago canadensis_
Wild mint	_Mentha spicata_
Rose-mallow	
Dead trees	
Path rush	_Juncus tenuis_
Coltsfoot	_Tussilago farfara_
Cardinal-flower	_Lobelia cardinalis_
Star-thistle	_Centaurium umbellatum_

15A. Wooded Old Field

Black raspberry	_Rubus occidentalis_
Eastern cottonwood	
Bigtooth aspen	_Populas grandidentata_
Red-osier dogwood	
Black willow	
Alder	_Alnus serrulata_
Staghorn sumac	
Box elder	
Quaking aspen	_Populas tremuloides_
Wild grape	_Vitus_ sp.
Meadow fescue	
Milkweed	_Asclepias_ sp.
Goldenrod	
Blue vervain	_Verbena hastata_
Common St. John's wort	_Hypericum perforatum_
Common tansy	_Tanacetum vulgare_
Lady's-thumb	_Polygonum persicaria_
Queen Anne's lace	
Scouring rush	_Equisetum_ sp.
Daisy fleabane	_Erigeron annuus_
Dead trees	

Table 2. (Continued)

16A. Hardwood Forest

Overstory	
Red oak	_Quercus borealis_ (_Q. rubra_)
Pignut hickory	_Carya glabra_
Shagbark hickory	_Carya ovata_
White oak	_Quercus alba_
Sugar maple	_Acer saccharum_
Pin oak	_Quercus palustris_
American beech	_Fagus grandifolia_
Black walnut	_Juglans nigra_
Understory	
American basswood	_Tilia americana_
Red-osier dogwood	
Silky dogwood	_Cornus obliqua_
Flowering dogwood	_Cornus florida_
Black cherry	_Prunus sorotina_
Witch hazel	_Hamamelis virginiana_
Ironwood	_Carpinus caroliniana_
Wild grape	
Greenbrier	_Smilax_ sp.
American chestnut	_Castanea dentata_ (root sprouts)
Northern arrowwood	_Viburnum recognitum_
Hawthorn	_Crataegus_ sp.
Poison ivy	_Rhus radicans_
Blueberry	_Vaccinium_ sp.
Dead trees	–

17. Island

* The scientific name for each plant species or genus is provided only the first time the species or genus appears on the table.

Table 3. Plant species found within the vegetation zones of the Cowles Creek area during the Four-Season Study, Geneva-on-the-Lake.

See Fig. 3

1.	Periodically Inundated Woodland	
	Dead trees	
	Northern arrowwood	Viburnum recognitum*
	Red-osier dogwood	Cornus stolonifera
	American elm	Ulmus americana
	Red oak	Quercus borealis (Q. rubra)
	Bittersweet nightshade	Solanum dulcamara
	Jewel-weed	Impatiens capensis
	False nettle	Boehmeria cylindrica
	Poison ivy	Rhus radicans
	Ash	Fraxinus sp.
	Hawthorn	Crataegus sp.
	Buckthorn	Rhamnus sp.
	Rice cutgrass	Leersia oryzoides
	Moneywort	Lysimachia nummularia
	Red raspberry	Rubus idaeus L. var. strigosus
	Solomon's seal	Polygonatum sp.
	Iris	Iris sp.
	Cardinal-flower	Lobelia cardinalis
2C.	Wet Meadow	
	Soft rush	Juncus effusus
	Phragmites	Phragmites communis
	Narrow-leaved cattail	Typha angustifolia
	River bulrush	Scirpus fluviatilis
	Sedges	Carex sp.
	Pigweed	Amaranthus tuberculatus
	Yellow sweet clover	Melilotus officinalis
	Goldenrod	Solidago sp.
	Rice cutgrass	
	Lady's-thumb	Polygonum persicaria
	Arrow-head	Sagittaria sp.
	Swamp milkweed	Asclepias incarnata
	Wild mint	Mentha spicata
	Common tansy	Tanacetum vulgare
	Aster	Aster sp.
	Iris	
	Virginia wild-rye	Elymus virginicus
2D.	Wet Meadow	
	Jewel-weed	
	Giant bur-reed	Sparganium eurycarpum
	Narrow-leaved cattail	

Table 3. (Continued)

2D. Wet Meadow (continued)	
Phragmites	
Rice cutgrass	
Sedges	
Arrow-head	
Wool-rush	*Scirpus cyperinus*
Canada wild-rye	*Elymus canadensis*
2E. Wet Meadow	
Reed canary grass	*Phalaris arundinacea*
Fescue	*Festuca* sp.
Narrow-leaved cattail	
Sedges	
Phragmites	
Goldenrod	
Soft rush	
Blue vervain	*Verbena hastata*
Rose-mallow	*Hibiscus palustris*
3D. Shallow Marsh	
Arrow-head	
Narrow-leaved cattail	
Red-osier dogwood	
Rice cutgrass	
Walter's millet	*Echinochloa walteri*
Jewel-weed	
Phragmites	
Nodding smartweed	*Polygonum lapathifolium*
Sweet flag	*Acorus calamus*
Duckweed	*Lemna* sp.
Prairie cord grass	*Spartina pectinata*
4C. Floating-Leaved Deep Marsh	
Spatter-dock	*Nuphar advena*
5. Open Water	
10. Beach	
11. Mowed Grass	
16B. Open Woodland Park	
White oak	*Quercus alba*

Table 3. (Continued)

16C. Hardwood Forest

Overstory	
White oak	
American basswood	Tilia americana
American beech	Fagus grandifolia
Ash	
Pignut hickory	Carya glabra
Shagbark hickory	Carya ovata
Chinquapin oak	Quercus muehlenbergii
Understory	
Ironwood	Carpinus caroliniana
American basswood	
Northern arrowwood	
Silky dogwood	Cornus obliqua
Wild rose	Rosa sp.
Red oak	
Paw paw	Asimina triloba
Wild grape	Vitus sp.

* The scientific name for each plant species or genus is provided only the first time the species or genus appears on the table.

Table 4. Plant species found within the vegetation zones of the Wheeler Creek area during the Four-Season Study, Geneva-on-the-Lake.

See Fig. 4.

2F.	Wet Meadow	
	Fescue	Festuca sp.*
	Reed canary grass	Phalaris arundinacea
	Bluejoint grass	Calamagrostis canadensis
	Grass-leaved goldenrod	Solidago graminifolia
	Yellow sweet clover	Meliotus officinalis
	Milkweed	Asclepias sp.
	Red-osier dogwood	Cornus stolonifera
	Dogwood	Cornus sp.
	Black willow	Salix nigra
	Staghorn sumac	Rhus typhina
	Raspberry	Rubus sp
	Chickweed	Stellaria sp.
	Queen Anne's lace	Daucus carota
	Soft rush	Juncus effusus
	Fox sedge	Carex vulpinoidea
	Sedge	Carex stipata
	Sedges	Carex spp.
3E.	Shallow Marsh	
	Sedges	
	Bluejoint grass	
	Black willow	
	Wool-rush	Scirpus cyperinus
	Dogwood	
	Arrow-head	Sagittaria sp.
	Rice cutgrass	Leersia oryzoides
	Dead trees	
	River bulrush	Scirpus fluviatilis
	Swamp loosestrife	Decadon verticillatus
	Soft rush	
	Elderberry	Sambucus sp.
4D.	Deep Marsh	
	Arrow-head	
	Giant bur-reed	Sparganium eurycarpum
	Narrow-leaved cattail	Typha angustifolia
	Pickerel-weed	Pontederia cordata
4E.	Floating-Leaved Deep Marsh	
	Spatter-dock	Nuphar advena
	Lesser duckweed	Lemna minor
	White water-lily	Nymphaea tuberosa

Table 4. (Continued)

5. Open Water	
Pondweed	*Potamogeton* sp.
10. Beach	
11. Mowed Grass	
12. Pasture	
15B. Wooded Old Field	
Red-osier dogwood	
Buttonbush	*Cephalanthus occidentalis*
Ash	*Fraxinus* sp.
Black willow	
Wild grape	*Vitus* sp.
Wild rose	*Rosa* sp.
Black cherry	*Prunus sorotina*
Apple	*Pyrus malus*
Sassafras	*Sassafras albidum*
Sugar maple	*Acer saccharum*
Red canary grass	
Sedges	
16D. Woodland	
Sugar maple	
Black willow	
Ash	
Red-osier dogwood	
Dogwood	
Wild grape	
Buttonbush	

* The scientific name for each plant species or genus is provided only the first time the species or genus appears on the table.

Table 5. Plant species known to occur within Geneva State Park and on the proposed list of threatened and endangered plants for the State of Ohio.*

Common and Scientific Name	Status**	Location***
Inland sea-rocket *Cakile edentula* var. *lacustris*	PPT	1, 4, 5
Seaside spurge *Euphorbia polygonifolia*	PPT	1, 5
Inland beach-pea *Lathyrus maritimus*	PT	1, 5
Purple sand-grass *Triplasis purpurea*	PPT	1
Leafy tussock sedge *Carex aquatilis*	PE	5
Water-starwort *Callitriche verna*	PT	2, 3
American water-milfoil *Myriophyllum exalbescens*	PPT	2
Slender naiad *Najas flexilis*	PPT	2
Nuttall's pondweed *Potamogeton epihydrus*	PPT	2

* Information provided by Natural Heritage Program, Division of Natural Areas and Preserves, Ohio Department of Natural Resources. All sightings occurred from 1975 through 1979.

** Status: PPT - proposed potentially threatened
PT - proposed threatened
PE - proposed endangered

*** Location: 1 - upper beach zone between marsh mouth and bathhouse
2 - marsh/swamp
3 - upstream of wooded swamp
4 - upper beach zone on either side of Cowles Creek mouth
5 - upper beach zone on either side of Wheeler Creek mouth

Table 6. Distribution and relative abundance of fish species collected during the Four-Season Study, Geneva-on-the-Lake.*

Species	Marsh/Swamp	Cowles Creek	Wheeler Creek
American brook lamprey	-	-	SE
Gizzard shad	A	C	U
Coho salmon	-	U	R
Rainbow trout (steelhead)	R	U	R
Rainbow smelt	R	C	C
Central mudminnow	U	R	-
Grass pickerel	U	-	-
Stoneroller	-	C	C
Goldfish	U	C	-
Carp	C	C	U
Golden shiner	A	C	-
Emerald shiner	A	A	C
Striped shiner	-	VC	A
Spottail shiner	U	A	VC
Sand shiner	-	VC	VC
Bluntnose minnow	U	A	A
Longnose dace	R	R	R
Creek chub	-	C	U
Quillback	-	R	-
White sucker	U	A	VC
Northern hog sucker	-	U	-
Spotted sucker	-	U	C
Golden redhorse	-	U	-
Shorthead redhorse	-	R	-
Black bullhead	R	-	-
Yellow bullhead	-	R	R
Brown bullhead	C	C	A
Stonecat	-	R	-
Trout-perch	-	A	VC
White bass	-	R	-
Green sunfish	U	U	-
Pumpkinseed	C	C	R
Bluegill	VC	C	-
Largemouth bass	VC	R	-
White crappie	A	-	-
Black crappie	A	U	U
Johnny darter	-	R	R
Yellow perch	U	-	-
Logperch	-	U	U
Freshwater drum	-	C	-
Total number of species	22	35	23

* The relative abundance terms used are comparable to those used by Trautman and Gartman (1974) and are defined as follows:

A - Abundant. A numerically dominant species.
VC - Very Common. A species readily caught in large numbers.
C - Common. A species caught in moderate to large numbers.
U - Uncommon. A species caught regularly but in small numbers.
R - Rare. A species caught infrequently and in small numbers.
SE - State endangered. A species on list of endangered wild animals in Ohio.

Table 7. Common and scientific names of fish species collected during the Four-Season Study, Geneva-on-the-Lake.

Common Name	Scientific Name
American brook lamprey	Lampetra lamottei (Lesueur)
Gizzard shad	Dorosoma cepedianum (Lesueur)
Coho salmon	Oncorhynchus kisutch (Walbaum)
Rainbow trout (steelhead)	Salmo gairdneri Richardson
Rainbow smelt	Osmerus mordax (Mitchill)
Central mudminnow	Umbra limi (Kirtland)
Grass pickerel	Esox americanus vermiculatus Lesueur
Stoneroller	Campostoma anomalum (Rafinesque)
Goldfish	Carassius auratus (Linnaeus)
Carp	Cyprinus carpio Linnaeus
Golden shiner	Notemigonus crysoleucas (Mitchill)
Emerald shiner	Notropis atherinoides Rafinesque
Striped shiner	Notropis chrysocephalus (Rafinesque)
Spottail shiner	Notropis hudsonius (Clinton)
Sand shiner	Notropis stramineus (Cope)
Bluntnose minnow	Pimephales notatus (Rafinesque)
Longnose dace	Rhinichthys cataractae (Valenciennes)
Creek chub	Semotilus atromaculatus (Mitchill)
Quillback	Carpiodes cyprinus (Lesueur)
White sucker	Catostomus commersoni (Lacepede)
Northern hog sucker	Hypentelium nigricans (Lesueur)
Spotted sucker	Minytrema melanops (Rafinesque)
Golden redhorse	Moxostoma erythrurum (Rafinesque)
Shorthead redhorse	Moxostoma macrolepidotum (Lesueur)
Black bullhead	Ictalurus melas (Rafinesque)
Yellow bullhead	Ictalurus natalis (Lesueur)
Brown bullhead	Ictalurus nebulosus (Lesueur)
Stonecat	Noturus flavus Rafinesque
Trout-perch	Percopsis omiscomaycus (Walbaum)
White bass	Morone chrysops (Rafinesque)
Green sunfish	Lepomis cyanellus Rafinesque
Pumpkinseed	Lepomis gibbosus (Linnaeus)
Bluegill	Lepomis macrochirus Rafinesque
Largemouth bass	Micropterus salmoides (Lacepede)
White crappie	Pomoxis annularis Rafinesque
Black crappie	Pomoxis nigromaculatus (Lesueur)
Johnny darter	Etheostoma nigrum Rafinesque
Yellow perch	Perca flavescens (Mitchill)
Logperch	Percina caprodes (Rafinesque)
Freshwater drum	Aplodinotus grunniens Rafinesque

Follows nomenclature in: Bailey, R.M., editor. 1970. A list of common and scientific names of fishes from the United States and Canada (third edition). Amer. Fish. Soc. spec. pub. No. 6. 150 p.

Table 8. Date, method, and location of fish collections made in the marsh/swamp complex during the Four-Season Study, Geneva-on-the-Lake.

4/6/78	A preliminary survey was performed by biologists from East Lansing and Columbus Field Offices prior to formal initiation of four-season study. Electroshocked the marsh with the small backpack shocker. Overnight trap net sets (1" sq. mesh body, 2" sq. mesh leads) in east and west pits and in marsh.
10/18/78	Electroshocked east and west pits and shrub swamp with the small backpack shocker for approximately 30 minutes in each location.
3/22/79	Overnight trap net set (½" sq. mesh body, 2" sq. mesh leads) in marsh creek mouth pool. Creek mouth open to lake.
3/28/79	Overnight trap net set (½" sq. mesh body, 2" sq. mesh leads) in marsh creek mouth pool. Creek mouth open to lake. Overnight rain covered net with debris. No fish were captured.
4/4/79	Overnight trap net set (½" sq. mesh body, 2" sq. mesh leads) in marsh creek mouth pool. Creek mouth open to lake. No fish were captured.
4/5/79	10:30 a.m. to 12:30 p.m. Electroshocked swamp from foot bridge upstream to Lake Road using Smith-Root Model VII backpack shocker.
4/11/79	Overnight trap net set (½" sq. mesh body, 2" sq. mesh leads) downstream of foot bridge. Creek mouth closed.
5/10/79	Overnight trap net set (½" sq. mesh body and leads) downstream of foot bridge. Creek mouth slightly open to lake.
6/22/79	12:30 a.m. to 1:15 a.m. Seined beach at closed mouth of marsh creek using 100' x 6' x ¼" sq. mesh bag seine.
8/7/79	Overnight trap net sets (½" sq. mesh body and leads) in SE corner of east pit and SE corner of west pit.
8/8/79	Overnight trap net sets (½" sq. mesh body and leads) off NW corner of island in east pit and in SW corner of west pit. Seined NE and NW corners of east pit with 100' x 6' x ¼" sq. mesh bag seine from 2:30 p.m. to 7:30 p.m.
8/9/79	Overnight trap net set (½" sq. mesh body and leads) in marsh off west dike of east pit. Seined NE and NW corners of west pit with 100' x 6" x ¼" sq. mesh bag seine from 12:30 p.m. to 4:30 p.m.

Table 9. Date, method, and location of fish collections made in Cowles Creek during the Four-Season Study, Geneva-on-the-Lake.

10/18/78	8:30 a.m. to 9:10 a.m. Electroshocked lower 50 meters of creek using the small backpack shocker.
3/22/79	Overnight trap net set (½" sq. mesh body, 2" sq. mesh leads) in mouth pool. Creek mouth open to lake.
4/25/79	Overnight trap net set (½" sq. mesh body and leads) in mouth pool. Creek mouth open to lake.
5/10/79	Overnight trap net set (½" sq. mesh body and leads) downstream of abandoned Lake Road bridge on west branch.
5/24/79	Overnight trap net set (½" sq. mesh body and leads) in mouth pool. Heavy rain washed out the net but some fish were captured.
6/21/79	11:30 p.m. to 6/22/79 12:30 a.m. Seined mouth pool using 100' x 6' x ¼" sq. mesh bag seine. Creek mouth open to lake.
7/19/79	Noon to 3:00 p.m. Electroshocked from mouth upstream to fork and 75 meters up each branch, using Coffelt VVP-15 electroshocker mounted in a johnboat. Creek mouth closed.
8/9/79	Electroshocked 300 meters of west branch downstream of Rt. 534 near southern corporation limit of Geneva-on-the-Lake using Smith-Root Model VII backpack shocker.

Table 10. Date, method, and location of fish collections made in Wheeler Creek during the Four-Season Study, Geneva-on-the-Lake.

4/4/79	Overnight trap net set (½" sq. mesh body, 2" sq. mesh leads) in mouth pool. Creek mouth open to lake. Wind switched to NW, causing lake surge up creek and washing out net. No fish were collected.
4/11/79	Overnight trap net set (½" sq. mesh body, 2" sq. mesh leads) in mouth pool. Creek mouth slightly open to lake.
4/25/79	Overnight trap net set (½" sq. mesh body and leads) upstream of Lake Road bridge. Creek mouth open to lake.
5/24/79	Overnight trap net set (½" sq. mesh body and leads) in mouth pool. Creek mouth was closed when net was set but overnight rain opened mouth and washed out the net. Some fish were collected.
6/22/79	1:30 a.m. to 2:30 a.m. Seined the mouth pool using a 100' x 6' x ¼" sq. mesh bag seine. Creek mouth open to lake.

Table 11. Number, life stage, and capture date by species of fish collected from the marsh/swamp complex during the Four-Season Study, Geneva-on-the-Lake.

	4/6/78 Trap Net & Shocker Marsh	4/6/78 Trap Net East Pit	4/6/78 Trap Net West Pit	10/18/78 Shocker Shrub Swamp
American brook lamprey				
Gizzard shad				
Coho salmon	*			
Rainbow trout (steelhead)				
Rainbow smelt	1			
Central mudminnow				
Grass pickerel	1A			
Stoneroller				
Goldfish				
Carp	2A	4A/1J		
Golden shiner				4J
Emerald shiner				
Striped shiner				
Spottail shiner	2			
Sand shiner				
Bluntnose minnow	1A			
Longnose dace	1A			
Creek chub				
Quillback				
White sucker	*			
Northern hog sucker				
Spotted sucker				
Golden redhorse				
Shorthead redhorse				
Black bullhead				
Yellow bullhead				
Brown bullhead	1J	14A		1A
Stonecat				
Trout-perch				
White bass				
Green sunfish	1A			
Pumpkinseed	10J			2J
Bluegill	3A/6J	4A		2YOY
Largemouth bass	1J	1A	1A	
White crappie	36J		11A	3J
Black crappie		33A	12A	1A/3J
Johnny darter				
Yellow perch				
Logperch				
Freshwater drum				

* Two coho salmon and two white suckers were captured in trap nets set in the lake off the mouths of the marsh creek and Cowles Creek.

Table 11. (Continued)

	10/18/78 Shocker East Pit	10/18/78 Shocker West Pit	3/22/79 Trap Net Mouth Pool	4/5/79 Shocker Wooded Swamp
American brook lamprey				
Gizzard shad				
Coho salmon				
Rainbow trout (steelhead)				1J
Rainbow smelt				
Central mudminnow				4A
Grass pickerel	1A		1A	1A
Stoneroller				
Goldfish				
Carp				
Golden shiner				1A
Emerald shiner				
Striped shiner				
Spottail shiner			3A	
Sand shiner				
Bluntnose minnow				
Longnose dace				
Creek chub				
Quillback				
White sucker				1A/2J
Northern hog sucker				
Spotted sucker				
Golden redhorse				
Shorthead redhorse				
Black bullhead				
Yellow bullhead				
Brown bullhead				
Stonecat				
Trout-perch				
White bass				
Green sunfish				1A
Pumpkinseed	3J/2YOY	Abundant J&YOY	1A	1J
Bluegill	5J/4YOY	Abundant J&YOY		
Largemouth bass	1A/1J	1J/1YOY		
White crappie	1A	8J		
Black crappie				
Johnny darter				
Yellow perch				
Logperch				
Freshwater drum				

Table 11. (Continued)

	4/11/79 Trap Net Foot Bridge	5/10/79 Trap Net Foot Bridge	6/22/79 Seine Beach	8/9/79 Trap Net Marsh
American brook lamprey				
Gizzard shad				
Coho salmon				
Rainbow trout (steelhead)				
Rainbow smelt				
Central mudminnow		3A		
Grass pickerel				
Stoneroller				
Goldfish		1J		
Carp				
Golden shiner	1J	1A		
Emerald shiner				
Striped shiner				
Spottail shiner			1A	
Sand shiner				
Bluntnose minnow				
Longnose dace				
Creek chub				
Quillback				
White sucker				
Northern hog sucker				
Spotted sucker				
Golden redhorse				
Shorthead redhorse				
Black bullhead				
Yellow bullhead				
Brown bullhead				
Stonecat				
Trout-perch				
White bass				
Green sunfish		3A		
Pumpkinseed	1J			
Bluegill	1J	1A		2YOY
Largemouth bass				1YOY
White crappie				
Black crappie	3J	2		
Johnny darter				
Yellow perch		1		
Logperch			1A	
Freshwater drum				

Table 11. (Continued)

	8/7&8/79 Trap Net East Pit	8/8/79 Seine East Pit	8/7&8/79 Trap Net West Pit	8/9/79 Seine West Pit
American brook lamprey				
Gizzard shad	3A/1J/2YOY	4A/137YOY	4J/9YOY	5A/160YOY
Coho salmon				
Rainbow trout (steelhead)				
Rainbow smelt				
Central mudminnow				
Grass pickerel				
Stoneroller				
Goldfish	1A			
Carp	1A	1A		
Golden shiner	2A	111A&J		1A/13JorYOY
Emerald shiner	1A	322A&J		34A&J
Striped shiner				
Spottail shiner				
Sand shiner				
Bluntnose minnow		2A		
Longnose dace				
Creek chub				
Quillback				
White sucker		2A/5J		
Northern hog sucker				
Spotted sucker				
Golden redhorse				
Shorthead redhorse				
Black bullhead		1A		
Yellow bullhead				
Brown bullhead	6A	8A/2J/1YOY		
Stonecat				
Trout-perch				
White bass				
Green sunfish			3A	
Pumpkinseed		1A/1J		
Bluegill	2A/3J	17J/4YOY	15A/9J	1A/12J/3YOY
Largemouth bass	1YOY	3YOY		81YOY
White crappie	22A/2J	104A/92J/93YOY	1J	
Black crappie	14A/3J/3YOY	6A/52J/13YOY	10A/6J	4A/16J/8YOY
Johnny darter				
Yellow perch		3J		
Logperch				
Freshwater drum				

A - Adult J - Juvenile YOY - Young of the Year

Table 12. Number, life stage, and capture date by species of fish collected from Cowles Creek during the Four-Season Study, Geneva-on-the-Lake.

	10/18/78 Shocker Lower 50 Meters	3/22/79 Trap Net Mouth Pool	4/25/79 Trap Net Mouth Pool	5/10/79 Trap Net Lake Road Bridge
American brook lamprey				
Gizzard shad			13	5
Coho salmon			*	
Rainbow trout (steelhead)			*	
Rainbow smelt		4A		
Central mudminnow		1A		
Grass pickerel				
Stoneroller				
Goldfish		3A/3J	3	
Carp		1A		1
Golden shiner		2A		
Emerald shiner		1A	134A&J	1
Striped shiner				
Spottail shiner	1YOY	138A&J	176A&J	
Sand shiner				
Bluntnose minnow	1A			
Longnose dace				
Creek chub				
Quillback			1	
White sucker		6A/2J	10A&J	
Northern hog sucker			1	
Spotted sucker				
Golden redhorse				
Shorthead redhorse		1A		
Black bullhead				
Yellow bullhead				
Brown bullhead	1YOY	13J		6
Stonecat				
Trout-perch		100A&J	480A&J	
White bass				
Green sunfish				1
Pumpkinseed	6YOY			
Bluegill	13YOY			
Largemouth bass				
White crappie				
Black crappie		3A		2
Johnny darter	1A			
Yellow perch				
Logperch				
Freshwater drum			2	

* Local fisherman indicated he had caught coho salmon and rainbow trout (steelhead) from the creek and beach area during March and April.

Table 12. (Continued)

	5/24/79 Trap Net Mouth Pool	6/21/79 Seine Mouth Pool	7/19/79 Shocker Lower 250 Meters	8/9/79 Shocker West Branch
American brook lamprey				
Gizzard shad	1	3J**	12A&J/1YOY	
Coho salmon				
Rainbow trout (steelhead)				
Rainbow smelt				
Central mudminnow				
Grass pickerel				
Stoneroller		9A,J&YOY	1A/4J	22A&J
Goldfish			4A&J	
Carp			29A&J/1YOY	2YOY
Golden shiner		1A**	33A&J	
Emerald shiner		abundant	1A/1J	
Striped shiner		very common	3A	3A&J
Spottail shiner		very common		
Sand shiner		very common		
Bluntnose minnow			102A&J/1YOY	6A&J
Longnose dace		3A		
Creek chub			2A	31A&J
Quillback			5YOY	
White sucker			24A&J/49YOY	50A&J/4YOY
Northern hog sucker			1A	
Spotted sucker			3J	
Golden redhorse			3J	
Shorthead redhorse				
Black bullhead				
Yellow bullhead			2A	
Brown bullhead	1		18YOY	
Stonecat		1A**		
Trout-perch				
White bass		3J**		
Green sunfish			1J	
Pumpkinseed			4J	
Bluegill				
Largemouth bass			1A	
White crappie				
Black crappie			1A	
Johnny darter				
Yellow perch				
Logperch		9A		
Freshwater drum		116J**		

** All or most of specimens for indicated species were collected in the shallow mixing zone where the creek meets the lake.

A - Adult J - Juvenile YOY - Young of the year

Table 13. Number, life stage, and capture date by species of fish collected from Wheeler Creek during the Four-Season Study, Geneva-on-the-Lake.

	4/11/79 Trap Net Mouth Pool	4/25/79 Trap Net Upstream of Bridge	5/24/79 Trap Net Mouth Pool	6/22/79 Seine Mouth Pool
American brook lamprey		**		
Gizzard shad	3J		1J	
Coho salmon	*			
Rainbow trout (steelhead)	*			
Rainbow smelt		***		
Central mudminnow				
Grass pickerel				
Stoneroller				3A/7YOY
Goldfish				
Carp	1J	1A		
Golden shiner				
Emerald shiner			3A	13A&J
Striped shiner				49A&J
Spottail shiner	18A	1A		1J
Sand shiner				14A&J
Bluntnose minnow				96A&J
Longnose dace				1A
Creek chub				1A
Quillback				
White sucker		6A	1A	7J/6YOY
Northern hog sucker				
Spotted sucker		8A		1J
Golden redhorse				
Shorthead redhorse				
Black bullhead				
Yellow bullhead		1A		
Brown bullhead		30A		1A
Stonecat				
Trout-perch			13A	
White bass				
Green sunfish				
Pumpkinseed				****
Bluegill				
Largemouth bass				
White crappie				
Black crappie		3A/1J		
Johnny darter				1A
Yellow perch				
Logperch				2A
Freshwater drum				

* Conversations with park personnel and local fishermen revealed that rainbow trout (steelhead) and salmon (probably coho) were caught in the creek during March 1979.

** On April 24, 1979, a local fisherman collected a number of American brook lampreys (state endangered species) several miles upstream of mouth.

*** Substantial smelt run occurred in creek during the third and fourth weeks of April 1979.

**** Several pumpkinseeds were caught by fishermen during early summer, 1979.

A - Adult J - Juvenile YOY - Young of the year

Table 14. Relative abundance and distribution of reptiles and amphibians observed during the Four-Season Study, Geneva-on-the-Lake.

Species	Relative Abundance	Distribution
Snapping turtle *Chelydra serpentina*	C	Marsh
Midland painted turtle *Chrysemys picta marginata*	A	Marsh, Cowles, Wheeler
Blanding's turtle *Emydoidea blandingi*	U	Marsh
Northern water snake *Natrix s. sipedon*	C	Marsh, Cowles, Wheeler
Eastern garter snake *Thamnophis s. sirtalis*	C	Marsh
Spotted salamander *Ambystoma maculatum*	U	Forest near swamp
Red-backed salamander *Plethodon c. cinereus*	C	Forest near swamp
American toad *Bufo americanus*	C	Marsh
Bullfrog *Rana catesbeiana*	U	Marsh
Green frog *Rana clamitans melanota*	A	Marsh, Cowles, Wheeler
Northern leopard frog *Rana pipiens*	C	Marsh, Cowles, Wheeler

A - Abundant

C - Common

U - Uncommon

Table 15. Distribution and status of birds observed during the Four-Season Study, Geneva-on-the-Lake.

Species	Area in which observed: Marsh	Cowles	Wheeler	Status
Common loon *Gavia immer*		x		M
Horned grebe *Podiceps auritus*	x	x	x	M
Pied-billed grebe *Podilymbus podiceps*	x	x		M
Great blue heron *Ardea herodias*	x	x		T
Green heron *Butorides virescens*	x	x	x	B
Great egret *Casmerodius albus*	x			M
Black-crowned night heron *Nycticorax nycticorax*	x	x		M
American bittern *Botaurus lentiginosus*		x		M
Canada goose *Branta canadensis*	x			B
Mallard *Anas platyrhynchos*	x	x	x	B
Black duck *Anas rubripes*	x			m
Pintail *Anas acuta*	x			M
Green-winged teal *Anas carolinensis*	x			M
Blue-winged teal *Anas discors*	x	x		1*
American wigeon *Anas americana*	x			M
Northern shoveler *Anas clypeata*	x			M
Wood duck *Aix sponsa*	x	x	x	B
Ring-necked duck *Aythya collaris*	x			M

Table 15. (Continued)

Species	Area in which observed: Marsh	Cowles	Wheeler	Status
Canvasback *Aythya valisineria*	x			M
Scaup *Aythya* sp.	x		x	M
Common goldeneye *Bucephala clangula*	x			M
Bufflehead *Bucephala albeola*	x			M
Oldsquaw *Clangula hyemalis*		x	x	M
Ruddy duck *Oxyura jamaicensis*		x		M
Hooded merganser *Lophodytes cucullatus*	x			M
Common merganser *Mergus merganser*	x	x	x	M
Red-breasted merganser *Mergus serrator*	x	x	x	M
Turkey vulture *Cathartes aura*	x			m
Sharp-shinned hawk *Accipiter striatus*	x	x	x	M
Red-tailed hawk *Buteo jamaicensis*	x	x		SR
Marsh hawk *Circus cyaneus*	x	x		M
American kestrel *Falco sparverius*	x	x	x	M
Ruffed grouse *Bonasa umbellus*	x			b
Sora *Porzana carolina*	x			M
Common gallinule *Gallinula chloropus*	x			M
American coot *Fulica americana*	x	x		M
Killdeer *Charadrius vociferus*	x	x		B

Table 15. (Continued)

Species	Area in which observed: Marsh	Cowles	Wheeler	Status
American woodcock *Philohela minor*	x	x		b
Common snipe *Capella gallinago*	x			M
Spotted sandpiper *Actitis macularia*	x	x	x	B
Solitary sandpiper *Tringa solitaria*	x			M
Yellowlegs *Tringa* sp.	x			M
Least sandpiper *Calidris minutilla*	x			M
Herring gull *Larus argentatus*	x	x		T
Ring-billed gull *Larus delawarensis*	x			T
Bonaparte's gull *Larus philadelphia*	x			M
Mourning dove *Zenaida macroura*	x	x	x	b
Yellow-billed cuckoo *Coccyzus americanus*	x			b
Great horned owl *Bubo virginianus*	x	x	x	SR
Chimney swift *Chaetura pelagica*	x	x		SR
Ruby-throated hummingbird *Archilochus colubris*	x			b
Belted kingfisher *Megaceryle alcyon*	x	x	x	B
Common flicker *Colaptes auratus*	x	x	x	B
Red-headed woodpecker *Melanerpes erythrocephalus*	x	x		B
Downy woodpecker *Picoides pubescens*	x	x		B

Table 15. (Continued)

Species	Area in which observed: Marsh	Cowles	Wheeler	Status
Eastern kingbird _Tyrannus tyrannus_	x	x	x	B
Great crested flycatcher _Myiarchus crinitus_	x			B
Eastern phoebe _Sayornis phoebe_	x			B
Willow flycatcher _Empidonax traillii_	x	x	x	B
Least flycatcher _Empidonax minimus_	x			B
Eastern wood pewee _Contopus virens_	x			b
Tree swallow _Iridoprocne bicolor_	x	x	x	B
Bank swallow _Riparia riparia_	x	x		SR
Barn swallow _Hirundo rustica_	x	x	x	B
Purple martin _Progne subis_	x	x		B
Blue jay _Cyanocitta cristata_	x	x		m
Common crow _Corvus brachyrhynchos_	x	x	x	SR
Black-capped chickadee _Parus atricapillus_	x	x		b
Tufted titmouse _Parus bicolor_		x		b
White-breasted nuthatch _Sitta carolinensis_	x			B
Brown creeper _Certhia familiaris_	x			m
Long-billed marsh wren _Cistothorus palustris_	x		x	B
Gray catbird _Dumetella carolinensis_	x	x		B

Table 15. (Continued)

Species	Area in which observed			Status
	Marsh	Cowles	Wheeler	
American robin *Turdus migratorius*	x	x	x	B
Wood thrush *Hylocichla mustelina*	x			b
Cedar waxwing *Bombycilla cedrorum*	x	x		b
Starling *Sturnus vulgaris*	x	x		b
Red-eyed vireo *Vireo olivaceus*	x	x		b
Warbling vireo *Vireo gilvus*	x			B
Yellow warbler *Dendroica petechia*	x	x	x	B
Yellow-rumped warbler *Dendroica coronata*	x			M
Common yellowthroat *Geothlypis trichas*	x	x	x	B
Hooded warbler *Wilsonia citrina*	x			m
American redstart *Setophaga ruticilla*	x			b
Eastern meadowlark *Sturnella magna*		x		m
Red-winged blackbird *Agelaius phoeniceus*	x	x	x	B
Northern oriole *Icterus galbula*	x	x		B
Common grackle *Quiscalus quiscula*	x	x	x	B
Brown-headed cowbird *Molothrus ater*		x		b
Cardinal *Cardinalis cardinalis*	x	x		B
Indigo bunting *Passerina cyanea*		x		B

Table 15. (Continued)

Species	Area in which observed: Marsh	Cowles	Wheeler	Status
American goldfinch *Carduelis tristis*	x	x		b
Tree sparrow *Spizella arborea*	x			M
Song sparrow *Melospiza melodia*	x	x	x	B

M - migrant, observed during normal migration period for the species and seldom or never found breeding in northeastern Ohio.

m - probable migrant, observed during normal migration period for the species but known to regularly breed in Ashtabula County.

T - transient, seen outside of normal migration period for species but not known to breed in Ashtabula County.

B - breeding within study areas (see Tables 16 and 17).

b - probable breeding species, occasionally seen during normal breeding season in study area and likely to be breeding within or near study area.

SR - summer resident, seen during breeding season and known to breed in Ashtabula County but daily forage range too large to determine if species is breeding within or near study area.

1* - drake was seen in marsh several times during breeding season but no nest or brood were found.

Table 16. Breeding birds observed in the marsh/swamp complex during the Four-Season Study, Geneva-on-the-Lake.

Species	Number of Breeding Pairs Observed	Number of Nests Found	Number of Broods Observed
Green heron	1		
Canada goose	1	1	
Mallard	1		1
Wood duck	2		2
Killdeer	1	1	
Spotted sandpiper	1		
Common flicker	2		
Red-headed woodpecker	1		
Eastern kingbird	2	2	
Great crested flycatcher	1		
Eastern phoebe	1		
Willow flycatcher	1		
Least flycatcher	1		
Tree swallow	Numerous		
Barn swallow	Numerous	1	
White-breasted nuthatch	1		
Long-billed marsh wren	1	1	
Gray catbird	4		
American robin	1		
Warbling vireo	1		
Yellow warbler	7	1	
Common yellowthroat	4		
Red-winged blackbird	10+	10	
Northern oriole	1		
Cardinal	1		
Song sparrow	4	1	

Table 17. Breeding birds observed in the Cowles Creek area during the Four-Season Study, Geneva-on-the-Lake.

Species	Number of Breeding Pairs Observed	Number of Nests Found	Number of Broods Observed
Mallard	1		1
Wood duck	2		2
Spotted sandpiper	1		
Belted kingfisher	1		
Common flicker	1		
Red-headed woodpecker	1		
Downy woodpecker	1		
Eastern kingbird	2	1	
Willow flycatcher	1		
Tree swallow	Common		
Barn swallow	Numerous		
Purple martin	Common		
Gray catbird	3		
American robin	2		
Yellow warbler	4		
Common yellowthroat	2		
Red-winged blackbird	4		
Common grackle	2		
Cardinal	3		
Indigo bunting	1		
Song sparrow	4		

Table 18. Waterfowl production, Four-Season Study, Geneva-on-the-Lake.

Species	Clutch Size	Brood Size	Class	Date Discovered	Nest* Initiation Date
Marsh/Swamp					
Canada goose	5	-	-	May 24	April 23 - April 28
Mallard	-	5+	IC	July 26	June 2 - June 10
Wood duck	-	4	IC	July 4	May 5 - May 9
Wood duck	-	4	IIA	Aug 7	June 1 - June 9
Cowles Creek					
Mallard	-	5	IC	July 4	May 10 - May 14
Wood duck	-	7	IIA	July 4	May 2 - May 10
Wood duck	-	9	IC	July 4	May 5 - May 9
Wheeler Creek					
Wood duck	-	3+	-	July 4	-

* Estimate using an incubation period of 28 days for Canada goose, 30 days for wood duck, and 28 days for mallard laying one egg per day with average clutch size.

Table 19. Water birds observed by date on marsh/swamp complex during the Four-Season Study, Geneva-on-the-Lake.

	Oct. '78		Nov. '78		Dec. '78	March 1979					April 1979								
	4 E	17 E *	9 A	30 A	1 A	15 A	21 A	22 M	28 A	29 M	4 AE	5 A	6 M	11 AE	12 M	18 A	19 M	25 A	26 M
Horned grebe	-	-	-	-	-	-	-	-	-	-	-	-	-	1	3	-	-	-	-
Pied-billed grebe	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-
Great blue heron	-	-	-	-	-	-	-	-	2	2	2	-	2	24	-	-	-	5	2
Green heron	1	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	2	-
Great egret	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Black-crowned night heron	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
Canada goose	-	-	-	16	-	-	-	16	2	-	-	-	-	2	2	-	2	-	2
Mallard	-	-	-	-	-	4	4	2	-	2	1	2	16	2	-	-	2	4	2
Black duck	-	-	-	-	1	-	-	-	-	-	-	-	1	-	-	-	-	-	-
Pintail	2	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-
Green-winged teal	-	-	-	-	-	-	-	-	-	21	-	-	9	-	-	-	-	-	-
Blue-winged teal	-	-	-	-	-	-	-	-	6	7	-	-	2	-	-	1	1	-	1
American wigeon	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
Northern shoveler	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-
Wood duck	160	60	-	2	-	-	2	2	6	31	5	1	-	-	-	2	-	4	2
Ring-necked duck	-	-	-	-	-	-	-	-	-	6	-	-	-	-	-	-	-	-	-
Canvasback	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-
Scaup	2	-	-	-	-	-	-	-	-	7	4	-	-	-	-	-	-	-	-
Common goldeneye	-	-	-	-	-	-	-	-	-	-	-	1	9	-	-	-	-	-	-
Bufflehead	-	-	-	-	-	-	-	3	-	-	-	1	4	1	-	-	-	-	-
Hooded merganser	-	-	-	-	-	-	31	34	-	-	-	2	-	-	-	-	-	-	-
Red-breasted merganser	-	-	-	2	-	-	-	-	-	-	-	-	30	1	10	-	-	-	-
Sora	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Common gallinule	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
American coot	11	50	1	-	1	-	-	-	-	-	-	-	1	-	-	-	-	1	-
Ring-billed gull	-	-	-	-	-	-	-	25	-	-	-	-	15	8	-	-	-	-	10
Bonaparte's gull	-	-	-	-	-	-	-	-	-	-	-	-	270	-	-	-	-	-	-

Table 19. (Continued)

	May 1979					June 1979						July 1979				August 1979						
	10 A	11 M	24 A	25 M	29 A	4 A	5 MA	6 M	13 E	14 M	22 M	3 A	4 M	25 A	26 M	7 AE	8 ME	9 E	23 E	24 M	30 E	31 M
Horned grebe	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pied-billed grebe	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Great blue heron	-	3	1	-	-	-	1A	-	-	1	-	-	-	3	1	3	1E	1	-	-	2	-
Green heron	-	-	-	-	-	-	-	1	-	1	1	-	-	-	-	-	1E	2	-	-	1	1
Great egret	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Black-crowned night heron	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Canada goose	-	-	2	-	2	-	19A	-	-	-	-	-	-	-	-	-	-	-	-	12	-	-
Mallard	2	-	2	-	-	-	-	-	-	-	1	-	-	1	6	-	12M	1	-	-	-	-
Black duck	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pintail	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Green-winged teal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Blue-winged teal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
American wigeon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Northern shoveler	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wood duck	-	2	2	-	3	-	4M	-	-	2	1	2	6	1	2	25	11E	61	115	4	177	6
Ring-necked duck	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Canvasback	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Scaup	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Common goldeneye	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bufflehead	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hooded merganser	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Red-breasted merganser	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sora	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Common gallinule	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
American coot	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring-billed gull	-	-	-	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bonaparte's gull	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 19. (Continued)

	September 1979				October 1979		
	5	12	20	26	4	11 *	29
	E	E	E	E	E	E	A
Horned grebe	-	-	-	-	-	-	-
Pied-billed grebe	-	-	-	-	-	-	-
Great blue heron	1	-	-	1	-	1	-
Green heron	1	-	-	1	-	-	-
Great egret	-	-	-	-	-	1	-
Black-crowned night heron	-	-	-	-	-	-	-
Canada goose	12	13	-	12	-	-	-
Mallard	-	2	-	3	-	-	-
Black duck	-	-	-	-	-	-	-
Pintail	-	-	-	-	-	-	-
Green-winged teal	-	-	-	-	-	-	-
Blue-winged teal	-	6	-	2	-	-	-
American wigeon	-	-	-	-	-	-	-
Northern shoveler	-	-	-	-	-	-	-
Wood duck	137	131	160	168	182	67	-
Ring-necked duck	-	-	-	-	-	-	-
Canvasback	-	-	-	-	-	-	-
Scaup	-	-	-	-	-	-	-
Common goldeneye	-	-	-	-	-	-	-
Bufflehead	-	-	-	-	-	-	-
Hooded merganser	-	-	-	-	-	-	-
Red-breasted merganser	-	-	-	-	-	-	-
Sora	-	-	-	-	-	-	-
Common gallinule	-	-	-	-	-	-	-
American coot	-	-	-	-	-	-	8
Ring-billed gull	-	-	-	-	-	-	-
Bonaparte's gull	-	-	-	-	-	-	-

M - Morning A - Afternoon E - Evening

* Marsh opened for waterfowl hunting in 1978 on October 19 and in 1979 on October 15.

Table 20. Water birds observed by dates on Cowles Creek and Wheeler Creek during the Four-Season Study, Geneva-on-the-Lake.

No waterfowl hunting was allowed on Cowles Creek or Wheeler Creek.

	Nov. '78	March '79	April 1979								May '79		June '79	
	30	29	4	5	11	12	18	19	25	26	10	24	5	13
	A	M	A	M	A	M	A	M	A	M	A	A	M	A
Cowles Creek														
Common loon	-	-	-	-	-	-	-	-	-	1	-	-	-	-
Horned grebe	-	-	2	-	2	9	7	7	-	3	-	-	-	-
Pied-billed grebe	-	-	-	-	-	-	-	1	-	-	-	-	-	-
Great blue heron	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Green heron	-	-	-	-	-	-	-	-	-	-	-	-	1	-
Black-crowned night heron	-	-	-	-	-	-	-	-	-	-	-	-	-	-
American bittern	-	-	-	-	-	-	-	1	-	-	-	-	-	-
Mallard	-	-	-	-	1	1	-	-	-	2	-	-	-	-
Blue-winged teal	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wood duck	5	-	-	-	-	-	1	3	-	-	-	-	2	-
Oldsquaw	-	-	-	-	-	-	-	-	-	1	-	-	-	-
Ruddy duck	-	-	-	-	-	-	-	-	-	2	-	-	-	-
Red-breasted merganser	-	-	10	-	15	-	-	6	-	32	-	-	-	-
American coot	-	2	-	-	-	-	-	-	-	1	-	-	-	-
Wheeler Creek														
Horned grebe	*		-	-	10	11	-	-	-	-	-	-		-
Great blue heron			-	-	-	-	-	-	-	-	-	-		-
Green heron			-	-	-	-	-	-	-	-	-	-		-
Wood duck			-	-	-	-	-	-	-	-	-	-		-
Oldsquaw			-	-	1	-	-	-	-	-	-	-		-
Red-breasted merganser			-	3	5	15	-	-	-	-	-	-		-

Table 20. (Continued)

	July '79		August 1979			September 1979				October 1979		
	4	25	23	24	31	6	13	21	26	3	11	29
	M	A	A	M	M	M	M	M	A	M	A	A
Cowles Creek												
Common loon	-	-	-	-	-	-	-	-	-	-	-	-
Horned grebe	-	-	-	-	-	-	-	-	-	-	-	-
Pied-billed grebe	-	-	-	-	-	-	-	-	-	-	-	-
Great blue heron	-	1	1	-	-	1	-	-	-	-	-	-
Green heron	-	-	-	-	1	2	1	-	-	-	-	-
Black-crowned night heron	-	-	-	-	-	-	1	-	-	-	-	-
American bittern	-	-	-	-	-	-	-	-	-	-	-	-
Mallard	6	-	-	-	-	-	-	-	-	-	-	-
Blue-winged teal	-	-	-	-	11	-	-	-	-	-	-	-
Wood duck	18	-	1	3	3	1	17	7	-	15	-	-
Oldsquaw	-	-	-	-	-	-	-	-	-	-	-	-
Ruddy duck	-	-	-	-	-	-	-	-	-	-	-	-
Red-breasted merganser	-	-	-	-	-	-	-	-	-	-	-	-
American coot	-	-	-	-	-	-	-	-	-	-	-	-
Wheeler Creek												
Horned grebe	-	-	-		-	-	-	-	-	-	-	-
Great blue heron	-	-	-		-	-	-	-	1	-	-	-
Green heron	-	-	-		-	1	-	-	1	-	-	-
Wood duck	3	-	2		-	-	-	-	2	-	-	-
Oldsquaw	-	-	-		-	-	-	-	-	-	-	-
Red-breasted merganser	-	-	-		-	-	-	-	-	-	-	-

M - Morning

A - Afternoon

* A blank column in the Wheeler Creek section indicates that the area was not surveyed on that date.

Table 21. Relative abundance and distribution of mammals found in the project area during the Four-Season Study, Geneva-on-the-Lake.*

Species	Relative Abundance	Distribution
Opposum _Didelphis marsupialis_	U	Marsh
Shorttail shrew _Blarina brevicauda_	A	Marsh, Cowles
Raccoon _Procyon lotor_	A	Marsh, Cowles, Wheeler
Mink _Mustela vison_	R	Marsh
Red fox _Vulpes fulva_	U	Marsh
Woodchuck _Marmota monax_	C	Park
Eastern chipmunk _Tamias striatus_	C	Marsh, Cowles
Eastern fox squirrel _Sciurus niger_	U	Marsh, Cowles
Red squirrel _Tamiasciurus hudsonicus_	U	Marsh
Beaver _Castor canadensis_	U	Marsh, Cowles
White-footed mouse _Peromyscus leucopus_	VC	Marsh, Cowles
Meadow vole _Microtus pennsylvanicus_	VC	Marsh, Cowles
Muskrat _Ondatra zibethica_	C	Marsh
Meadow jumping mouse _Zapus hudsonius_	R	Marsh
Eastern cottontail _Sylvilagus floridanus_	U	Marsh, Cowles
Whitetail deer _Odocoileus virginianus_	C	Marsh

* Presence noted by visual observations, live trapping, tracks, and scats.

A - Abundant
VC - Very Common
C - Common
U - Uncommon
R - Rare

Table 22. Small mammal trapping success on the marsh/swamp complex and Cowles Creek area during the Four-Season Study, Geneva-on-the-Lake.

Species	Number Caught	% of Catch
Marsh/Swamp		
Shorttail shrew	14	58
Eastern chipmunk	1	4
White-footed mouse	2	8
Meadow vole	6	26
Meadow jumping mouse	1	4
Total	24	100
Cowles Creek		
Shorttail shrew	3	23
Eastern chipmunk	2	16
White-footed mouse	7	53
Meadow vole	1	8
Total	13	100

Table 23. Water levels in the marsh/swamp complex during the Four-Season Study, Geneva-on-the-Lake.

Date & Approximate Time of Reading*		Condition of Creek Mouth	Water Elevation at Gauge			Water Elevation of Lake**
			Mouth	Foot Bridge	Road	
4/11	3 PM	Open	572.37	572.97	574.44	571.70
	6 PM	Closed	2.73	2.97	4.44	1.70
4/12	9 AM	Closed	3.17	3.27	4.48	1.77
4/18	6 PM	Open	2.54	2.76	4.15	2.04
4/19	9 AM	Closed	2.83	2.87	4.11	2.05
4/26	6 AM	Open	2.15	2.62	3.96	2.04
5/10	2 PM	Closed	3.03	3.03	3.72	2.07
5/24	2 PM	Closed	3.27	3.27	3.64	2.13
6/5	7 AM	Open	2.62	2.59	3.64	2.22
6/6	9 AM	Open	2.69	2.73	3.64	2.34
6/13	7 PM	Closed	3.79	3.75	3.80	2.23
6/22	11 AM	Closed	3.47	3.45	3.49	2.23
7/3	5 PM	Closed	3.45	3.43	3.54	2.26
7/4	9 AM	Closed	3.49	3.47	3.54	2.30
7/19	10 AM	Closed	3.06	3.06	3.14	2.19
7/25	3 PM	Closed	2.87	2.89	3.14	2.10
7/26	9 AM	Closed	2.87	2.87	3.14	2.16
8/9	10 AM	Closed	3.43	3.47	3.44	2.18
8/23	5 PM	Closed	3.69	3.69	3.72	1.96
8/24	9 AM	Closed	3.75	3.73	3.77	2.03
8/31	8 AM	Closed	3.79	3.79	3.82	2.05
9/5	5 PM	Closed	3.67	3.69	3.71	2.08
9/13	8 AM	Closed	3.50	3.49	3.54	1.89
9/26	6 PM	Closed	3.27	3.27	3.29	1.89
10/3	9 AM	Closed	3.47	3.37	3.54	1.76
10/11	6 PM	Open	3.92	3.82	4.54	1.52
10/29	1 PM	Closed	4.21	4.21	4.24	1.50
12/20	1 PM	Closed	4.12	4.12	4.60	1.39

* All dates are for calendar year 1979.

** Elevation of Lake Erie derived from 1979 Hourly and 1979 Daily Mean Water Levels, IGLD (1955), Fairport Harbor, U. S. Department of Commerce, NOAA, Rockville, Maryland.

Table 24. Water levels in Cowles Creek during the Four-Season Study, Geneva-on-the-Lake.

Date & Approximate Time of Reading*		Condition of Creek Mouth	Water Elevation of Cowles Creek	Water Elevation of Lake**
4/11	3 PM	Open	572.08	571.70
4/12	10 AM	Open	2.66	1.89
4/18	6 PM	Open	2.25	2.04
4/19	8 AM	Open	2.28	2.09
4/25	6 PM	Open	2.18	2.02
6/4	8 PM	Not recorded	2.30	2.26
6/5	9 AM	Not recorded	2.38	2.23
6/6	11 AM	Open	2.30	2.32
6/13	8 PM	Not recorded	2.30	2.21
6/22	1 PM	Open	2.50	2.20
7/3	6 PM	Open	3.06	2.22
7/4	10 AM	Not recorded	3.10	2.30
7/19	11 AM	Closed	3.25	2.19
7/25	4 PM	Open	3.08	2.09
8/24	10 AM	Open	2.55	2.06
8/31	11 AM	Closed	2.78	2.05
9/5	6 PM	Closed	2.90	2.08
9/13	10 AM	Closed	3.90	1.88
9/21	9 AM	Open	2.40	1.89
9/26	10 AM	Open	3.07	1.87
10/3	9 AM	Open	3.00	1.85
10/11	6 PM	Open	2.30	1.52
10/29	2 PM	Open	2.81	1.50
12/20	2 PM	Open	2.95	1.39

* All dates are for calendar year 1979.

** Elevation of Lake Erie derived from 1979 Hourly and 1979 Daily Mean Water Levels, IGLD (1955), Fairport Harbor, U. S. Department of Commerce, NOAA, Rockville, Maryland.

Table 25. Water levels in Wheeler Creek during the Four-Season Study, Geneva-on-the-Lake.

Date & Approximate Time of Reading*		Condition of Creek Mouth	Water Elevation of Wheeler Creek	Water Elevation of Lake**
4/12	8 AM	Open	572.95	571.80
4/18	6 PM	Open	2.49	2.04
4/19	8 AM	Open	2.34	2.08
4/25	7 PM	Open	2.25	2.04
4/26	10 AM	Open	2.20	2.06
5/10	3 PM	Not recorded	2.63	2.08
5/24	2 PM	Closed	3.17	2.13
6/5	Noon	Open	2.73	2.28
6/6	6 AM	Open	2.35	2.36
6/13	8 PM	Not recorded	1.97	2.20
7/3	7 PM	Not recorded	3.93	2.23
7/4	Noon	Not recorded	4.05	2.30
7/25	8 PM	Closed	3.29	2.10
8/31	11 AM	Closed	2.45	2.05
9/5	6 PM	Closed	2.85	2.08
9/13	11 AM	Closed	3.53	1.87
9/21	11 AM	Closed	3.55	1.98
9/26	5 PM	Open	2.13	1.86
10/3	10 AM	Open	2.74	1.83
10/11	5 PM	Open	2.55	1.49
10/29	2 PM	Open	2.35	1.50
12/20	Noon	Open	4.07	1.39

* All dates are for calendar year 1979.

** Elevation of Lake Erie derived from 1979 Hourly and 1979 Daily Mean Water Levels, IGLD (1955), Fairport Harbor, U. S. Department of Commerce, NOAA, Rockville, Maryland.

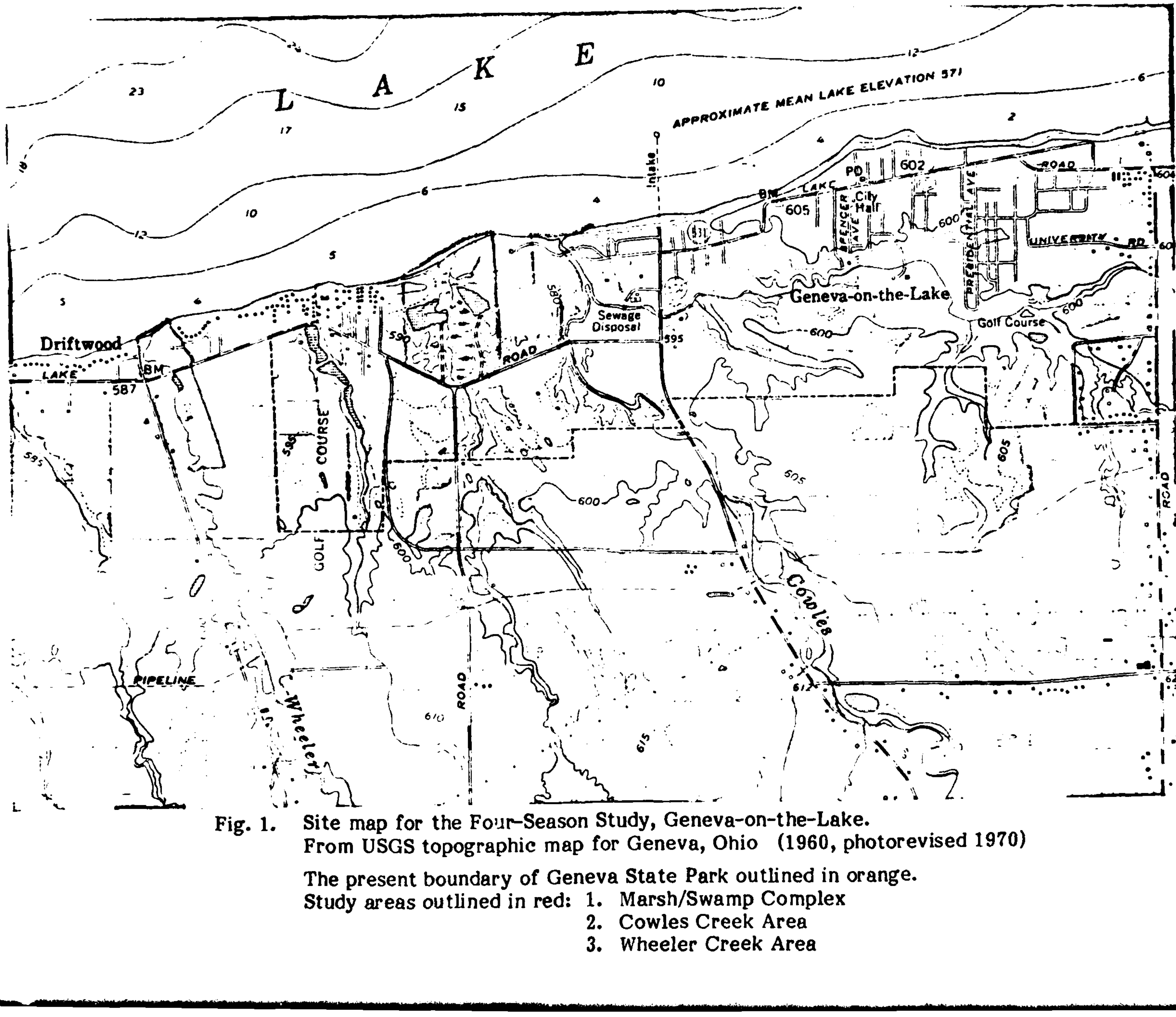


Fig. 1. Site map for the Four-Season Study, Geneva-on-the-Lake.
From USGS topographic map for Geneva, Ohio (1960, photorevised 1970)

The present boundary of Geneva State Park outlined in orange.
Study areas outlined in red:
1. Marsh/Swamp Complex
2. Cowles Creek Area
3. Wheeler Creek Area

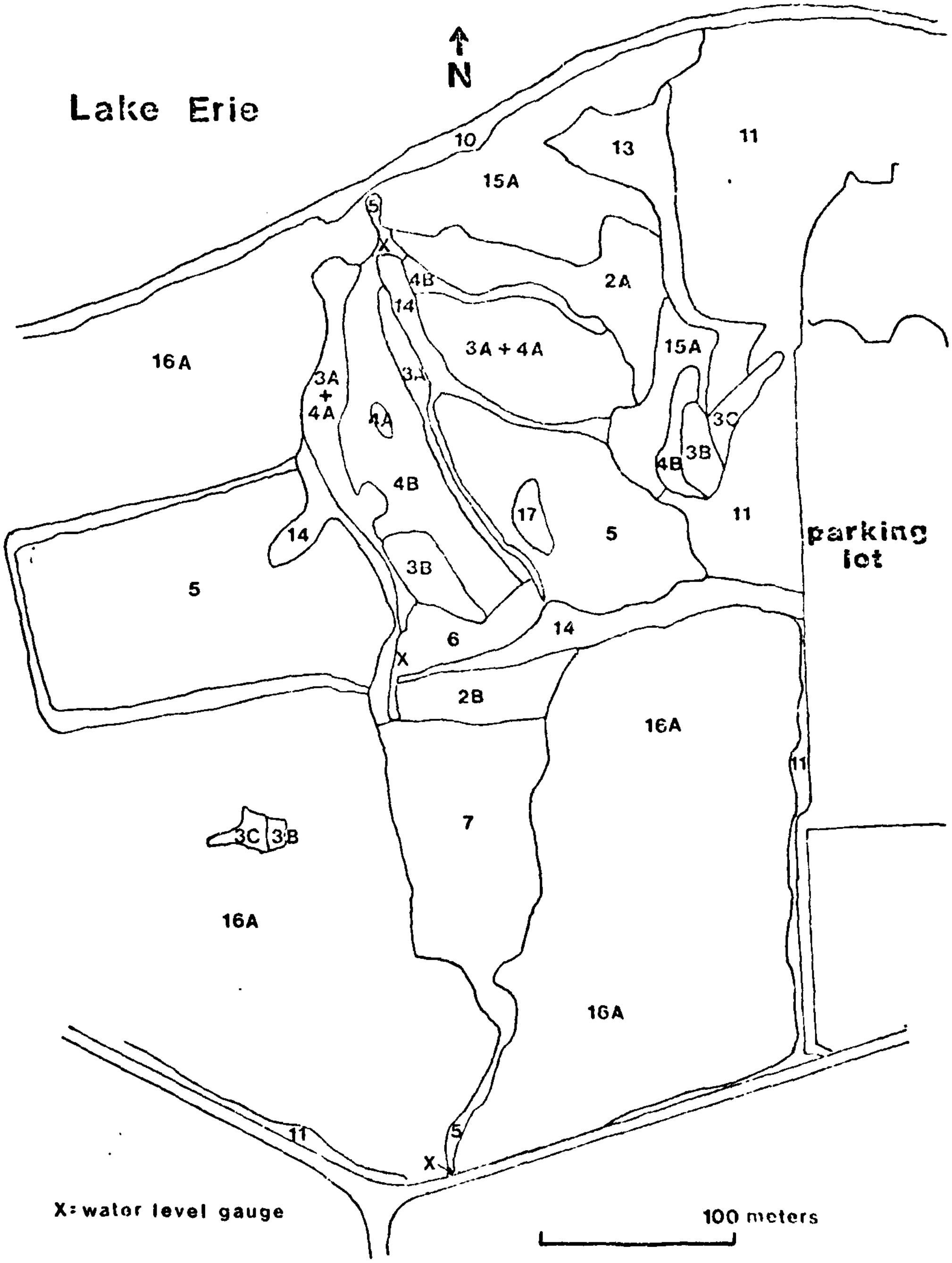


Fig. 2. Cover map of vegetation zones within the marsh/swamp complex. Four-Season Study, Geneva-on-the-Lake

2A, 2B........	Wet meadow	10....	Beach
3A, 3B, 3C...	Shallow marsh	11....	Mowed grass
4A, 4B........	Deep marsh	13....	Meadow
5.............	Open water	14....	*Dike*
6.............	Shrub swamp	15A...	Wooded old field
7.............	Wooded swamp	16A...	Hardwood forest
		17....	Island

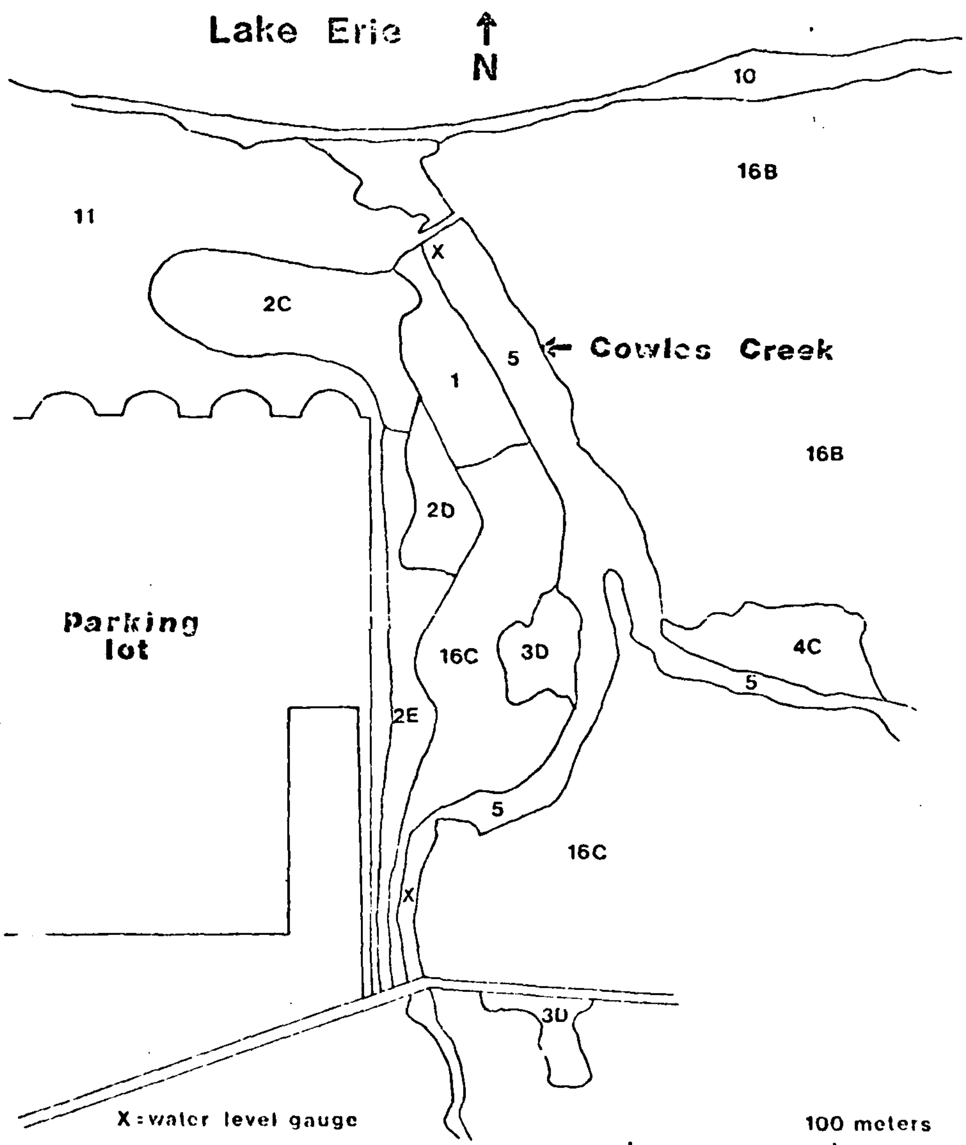


Fig. 3. Cover map of the vegetation zones within the Cowles Creek area.

Four-Season Study, Geneva-on-the-Lake

1.............	Periodically flooded woodland	10....	Beach
2C, 2D, 2E...	Wet meadow	11....	Mowed grass
3D...........	Shallow marsh	16B...	Woodland park
4C...........	Deep marsh	16C...	Hardwood forest
5.............	Open water		

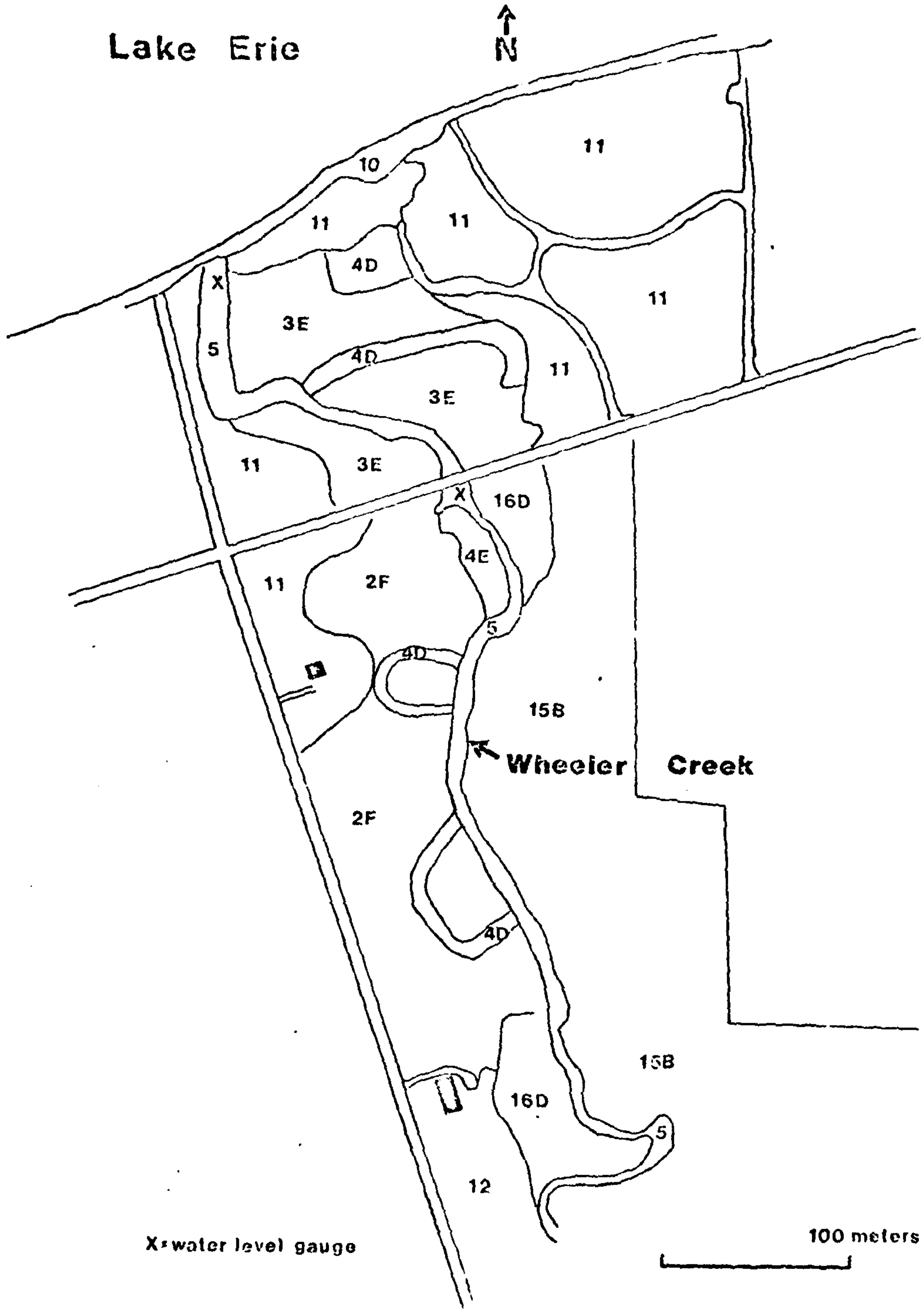


Fig. 4. Cover map of the vegetation zones within the Wheeler Creek area.

Four-Season Study, Geneva-on-the-Lake

2F........	Wet meadow	10......	Beach
3E........	Shallow marsh	11......	Mowed grass
4D, 4E....	Deep marsh	12......	Pasture
5.........	Open water	15B.....	Wooded old field
		16D.....	Woodland

Fig. 5. Marsh/Swamp Complex. View of beach (zone 10) and Salix/Populus association on north edge of forest (zone 16A). Closed mouth of marsh visible in left foreground. Photographed 8/79 looking west.

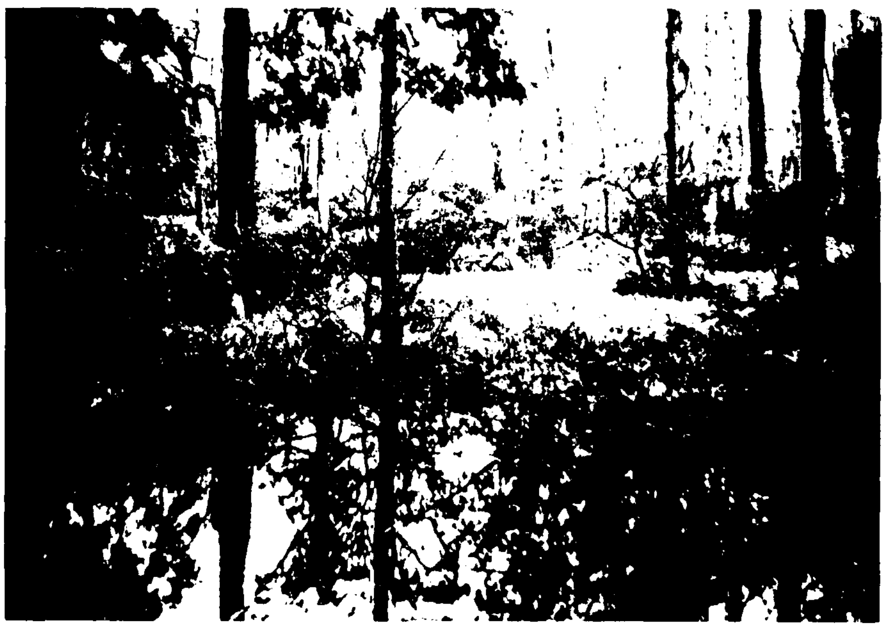


Fig. 6. Marsh/Swamp Complex. View of wooded swamp (zone 7). Photographed 10/78 from NE side looking SW.

Fig. 7. Marsh/Swamp Complex. View of shrub swamp (zone 6). Photographed 8/79 from wooden foot bridge looking north.

Fig. 8. Marsh/Swamp Complex. View of floating-leaved marsh (zone 4B) in foreground, and shallow cattail marsh (zone 3A) and dike (zone 14) in background. Photographed 8/79 from SW side of marsh looking NE.

Fig. 9. Marsh/Swamp Complex. View of marsh mouth approximately 40 m south of lake shore, looking south. Photographed 3/79 when marsh was open to the lake.

Fig. 10. Marsh/Swamp Complex. View of marsh mouth approximately 40 m south of lake shore, looking south. Photographed 9/78 when marsh mouth was closed to lake.

Fig. 11. Marsh/Swamp Complex. View of NE part of floating-leaved deep marsh (zone 4B), looking SE from near marsh mouth. Photographed 3/79 when marsh was open to the lake.

Fig. 12. Marsh/Swamp Complex. View of NE part of floating-leaved deep marsh (zone 4B), looking SE from beach on SW side of marsh mouth. (Willow tree just right of center in Fig. 11 is just left of center in Fig. 12) Photographed 8/79 when marsh mouth was closed.

United States Department of the Interior

FISH AND WILDLIFE SERVICE

IN REPLY REFER TO:

East Lansing Area Office
Manly Miles Building, Room 202
1405 South Harrison Road
East Lansing, Michigan 48823

Colonel George P. Johnson
District Engineer
U. S. Army Engineer District
Buffalo
1776 Niagara Street
Buffalo, New York 14207

Dear Colonel Johnson:

This is our final Fish and Wildlife Coordination Act Report for the proposed Geneva-on-the-Lake Small Boat Harbor on Lake Erie, Ashtabula County, Ohio. The project planning was undertaken pursuant to Section 6 of Public Law 79-14, approved March 2, 1945. This report has been prepared under the authority of and in accordance with provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.) and in compliance with the intent of the National Environmental Policy Act of 1969.

Our earlier coordination with your office concerning the reformulated harbor project included planning aid letters dated March 7 and May 15, 1978; letters dated May 4 and July 2, 1979 providing comments on the four suggested alternative harbor layouts; and the results of the Four-Season Study submitted April 3, 1980.

Alternatives Considered

On May 28, 1980, representatives of the U. S. Fish and Wildlife Service and the Ohio Department of Natural Resources (ODNR) met to discuss the four structural alternatives still being considered, those being:

Alternative 1 - All-Weather Harbor at Cowles Creek

Alternative 2 - All-Weather Offshore/Onshore Harbor

Alternative 3 - All-Weather Wetland/Parking Lot Harbor

Alternative 4 - All-Weather Wetland Harbor

It was agreed that with appropriate fish and wildlife mitigation, a modified version of Alternative 3 was acceptable to both parties.

On June 26, 1980, representatives of the above two agencies and the Buffalo Corps met at the project site to finalize the selection of the recommended alternative and to discuss mitigation. The recommended alternative, as suggested in the July 17, 1979 letter from

EXHIBIT G-3

Mr. Swartzmiller (ODNR) to Mr. Liddell of your staff, is a modification of Alternative 3 designed to accomodate 360 boats. A minor realignment of the west boundary of the marina was agreed to by all parties and is illustrated in your August 1980 drawing titled Alternative Plan 3b (360 Boat Marina). The major features of that drawing are reproduced in Figure 1 (attached).

Impacts of Recommended Alternative Plan 3b

The major potential impacts of Alternative Plan 3b are listed below.

1. The construction of the breakwaters flanking the entrance channel will prevent the formation of a littorally deposited bar across the mouth of the marsh creek. Data from our Four-Season Study indicate that without the bar, the water level within the marsh/swamp complex would be approximately the same as the lake level; resulting in a loss of water surface area of greater than 50 percent. Vegetative diversity would also decrease as water level fluctuations would be minimized.

2. The excavation of the harbor basin along the east side of the marsh where the existing bottom elevation is approximately +3 feet (all elevations refer to low water datum elevation 568.6 feet above mean water level at Father Point, Quebec (IGLD 1955)) would partially dewater the marsh/swamp complex even if the marsh creek mouth were blocked by a littorally deposited bar.

3. The excavation of the harbor basin will result in the loss of approximately 1.3 acres of marsh (shallow and deep marsh combined) and approximately one acre of wet meadow. During the Four-Season Study, it was noted that the area of marsh proposed to be excavated produced one brood of Canada geese and served as a feeding area for wood duck broods, mallards, and coots. The section of marsh nearest the parking lot also contained the most diverse community of aquatic vegetation found anywhere in the study area.

4. Use of the shrub swamp for night roosting by wood ducks may be reduced in August, September, and October due to human activity in the harbor or along foot trails adjacent to the shrub swamp.

Fish and Wildlife Mitigation Plan

The following mitigation measures have been agreed to in principle by the Service, ODNR, and the Corps to prevent or reduce losses of fish and wildlife resources associated with the selection of Alternative Plan 3b.

1. To maintain water levels within the wetland, a water control structure will be built across the mouth of the marsh creek. It will consist of an earthen dike with a top elevation of +6 feet. Contained within the dike will be a stop-log structure with aluminum logs. The stop-log structure will be approximately five feet wide, with a bottom elevation of +3 feet, and a top elevation of +6 feet. Seasonal water level control in approximately 6-inch increments will be possible. The water levels should be selected to encourage waterfowl production and to provide feeding and resting areas for spring and fall migrants. These levels should approximate the following elevations:

Ice-out to mid-June +5 feet

Mid-June thru August +4.5 feet

September to ice-out +5.5 feet

As the final selection of seasonal water levels can only be made after an analysis of the condition and diversity of the aquatic vegetation, the management of water levels should be overseen by wildlife biologists from the Ohio Division of Wildlife.

2. To prevent water loss from the wetland into the harbor basin, an impermeable dike with a top elevation of +8 feet will be constructed along the entire west side of the harbor. The dike will have a top width of ten feet and will be riprapped on the harbor side. A four-foot wide path will be maintained on the harbor side of the dike to allow access to the water control structure.

3. To compensate for the loss of wetland areas excavated for the harbor, some of the excavated material will be used to partially fill ponds "A" and "B" to increase their value to waterfowl. While the partial filling will decrease the warmwater fish communities in the ponds and may decrease use of the ponds by diving ducks, use of these areas by puddle ducks should increase substantially. Loss of fish production in the ponds and fishermen use should be more than offset by the construction of the rubble mound breakwaters flanking the entrance channel.

   In an attempt to insure the best possible substrate for the development of aquatic vegetation in the ponds, the fill material should be placed in the ponds with the broken shale and clay subsoil in the bottom layer, covered with a top layer (at least one foot thick) of organic muck and topsoil that has been excavated from the wetland portion of the harbor basin. The fill material should be compacted and sown with perennial rye grass. The approximate desired surface elevations for the fill material are illustrated in Figures 2 and 3 (attached). To insure proper placement of the material, the ponds need to be dewatered by pumping. Upon completion of the work in Pond "A", the existing shallow connection between the pond and the main wetland should be deepened to an elevation of +4 and widened to a five-foot bottom width with 3:1 side slopes.

   The concrete, asphalt, and soil contaminated with petroleum products that will be excavated from the parking lot and sidewalks is not suitable material for use as fill in the ponds. These materials, plus all other unused excavated materials, should be taken to an upland disposal site, such as the campground sites.

   In its existing state, the wetland is often flushed of sediments and dead plant material by the breaching of the sandbar and the rapid dewatering of the wetland, thus counteracting the natural aging process of the wetland. Replicating this flushing action within the partially filled ponds by the use of the water control structure may not be possible. If the accumulation of sediment and plant debris substantially reduces the water depths of the modified ponds, mechanical removal of the accumulated material may become necessary to insure the continued use of the areas by waterfowl. Such maintenance for a period equal to the useful life of the harbor should be guaranteed as a part of the fish and wildlife mitigation plan for the project.

4. To provide a visual and auditory buffer between the harbor and the wetland, shrubs will be planted along almost the entire length of the 1200-foot dike constructed on the west side of the harbor. Only the 175-foot south end of the dike need not be planted with shrubs. A mixture of red-osier dogwood (Cornus stolonifera), silky dogwood (C. amomum) and red-panicle dogwood (C. racemosa) is preferred. Plants should be spaced approximately four feet apart in two rows, one row on the west edge of the dike top (elevation +8 feet) and another row on the west slope of the dike at an approximate elevation of +7 feet. A ground cover of perennial rye grass which is commonly used on the state refuge dikes would be appropriate on the harbor dike.

   After the partial filling of pond B has been completed, the access road should be covered with topsoil and planted with perennial rye grass. Shrub plantings should also be made along the south and west sides of the shrub swamp area to augment the present vegetation and to further reduce human disturbance of night roosting wood ducks. If the rate of survival of the planted shrubs is insufficient to establish an adequate barrier, replacement plantings should be made. See Figure 4 (attached) for desired configuration of plantings along the dike and adjacent to the shrub swamp.

   If a foot trail is to be built adjacent to the wetland for interpretive purposes, care should be taken so that increased human activity does not substantially reduce the use of the wetland by waterfowl.

Summary

If properly implemented and maintained, the proposed mitigation plan should adequately offset the impacts upon the wetland habitat caused by the construction of the small boat harbor as proposed under Alternative Plan 3b. However, the success of the proposed mitigation measures in maintaining high waterfowl use in the wetland depends on sufficiently minimizing human disturbance of the wetland. Such control is often difficult to achieve and rests on the efforts of ODNR.

We are presently working with ODNR to retrieve data from their Lake Erie Shoreline Creel Census that might be useful in a further analysis of the economic justification for capping one or both of the harbor breakwaters for improved fisherman access. The data will include fishing pressure and harvest at the eleven survey sites in Ashtabula and Lake Counties for 1975, 1976, and 1977. We have also solicited data from ODNR concerning the projected number of campers and day-users for Geneva State Park and an estimate of the percentage of these users that would be expected to fish from the shoreline at the park. We will be sending copies of all data to your office when available and will be in further contact concerning the analysis of the data.

Sincerely yours,

John Popowski

Area Manager

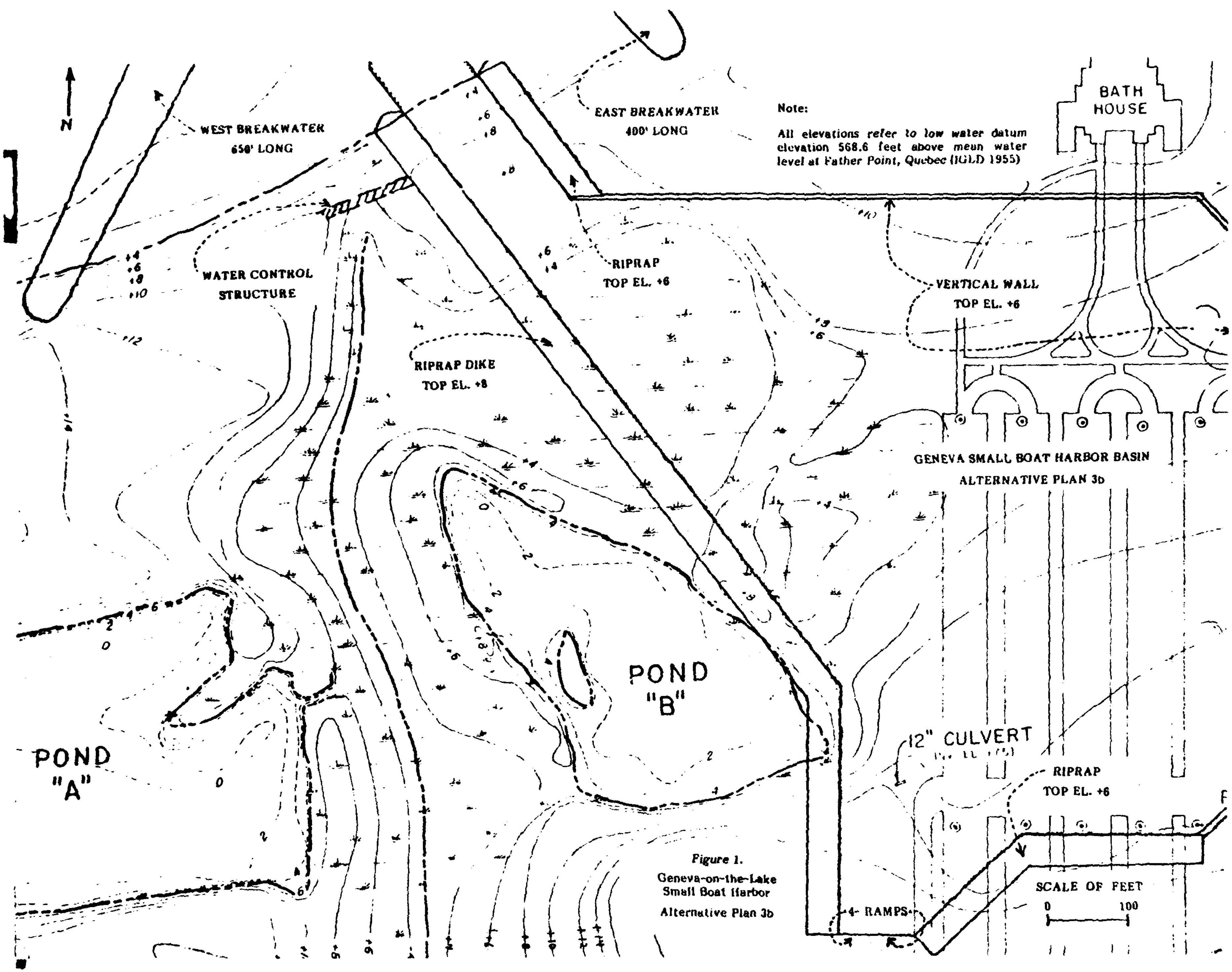
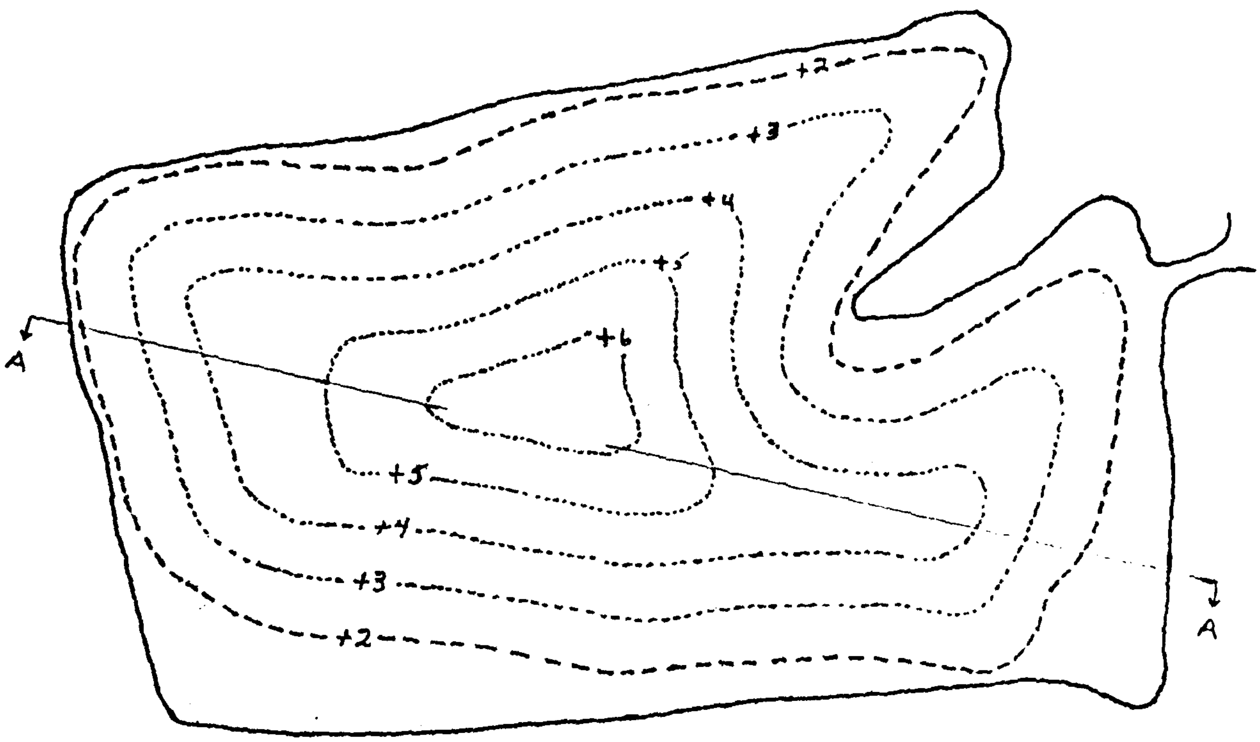


Figure 1.
Geneva-on-the-Lake
Small Boat Harbor
Alternative Plan 3b



Section A - A

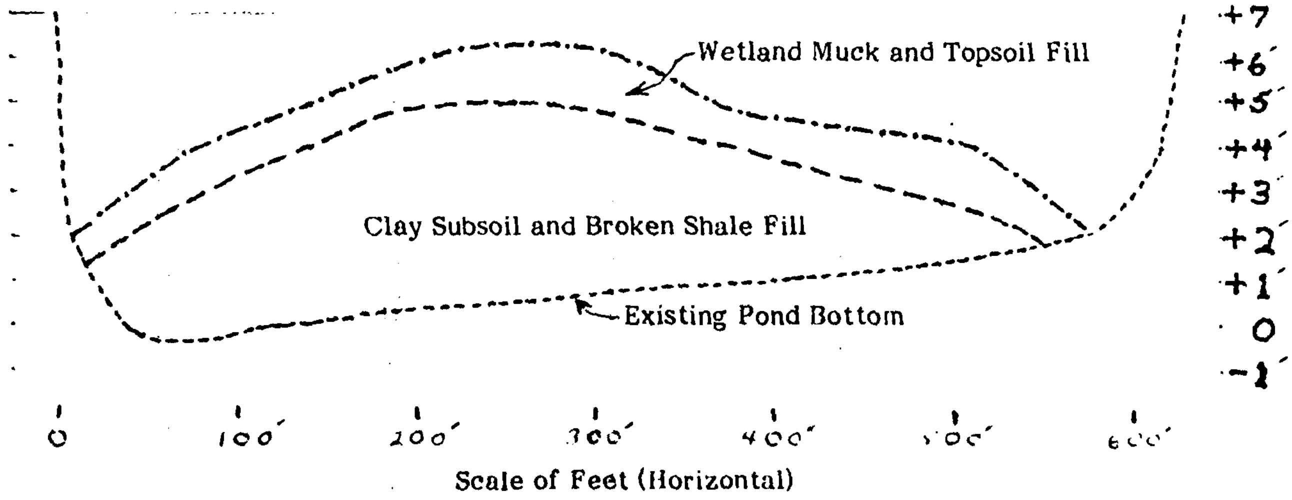


Figure 2. Pond "A" Recommended Elevations of Fill

All elevations are referenced to Low Water Datum elevation 568.6 feet (IGLD 1955)

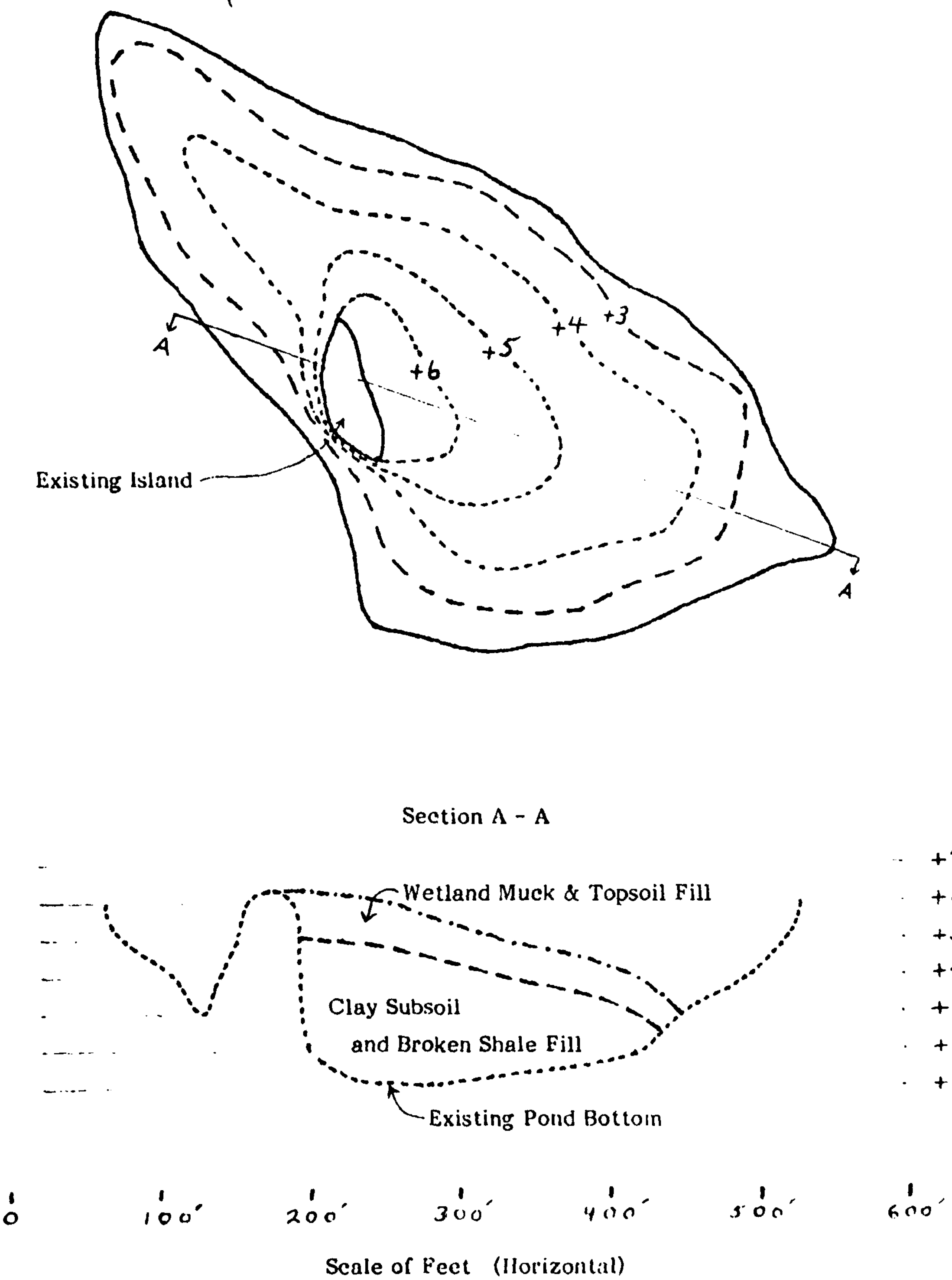


Figure 3. Pond "B" Recommended Elevations of Fill

All elevations are referenced to Low Water Datum elevation 568.6 feet (IGLD 1955)

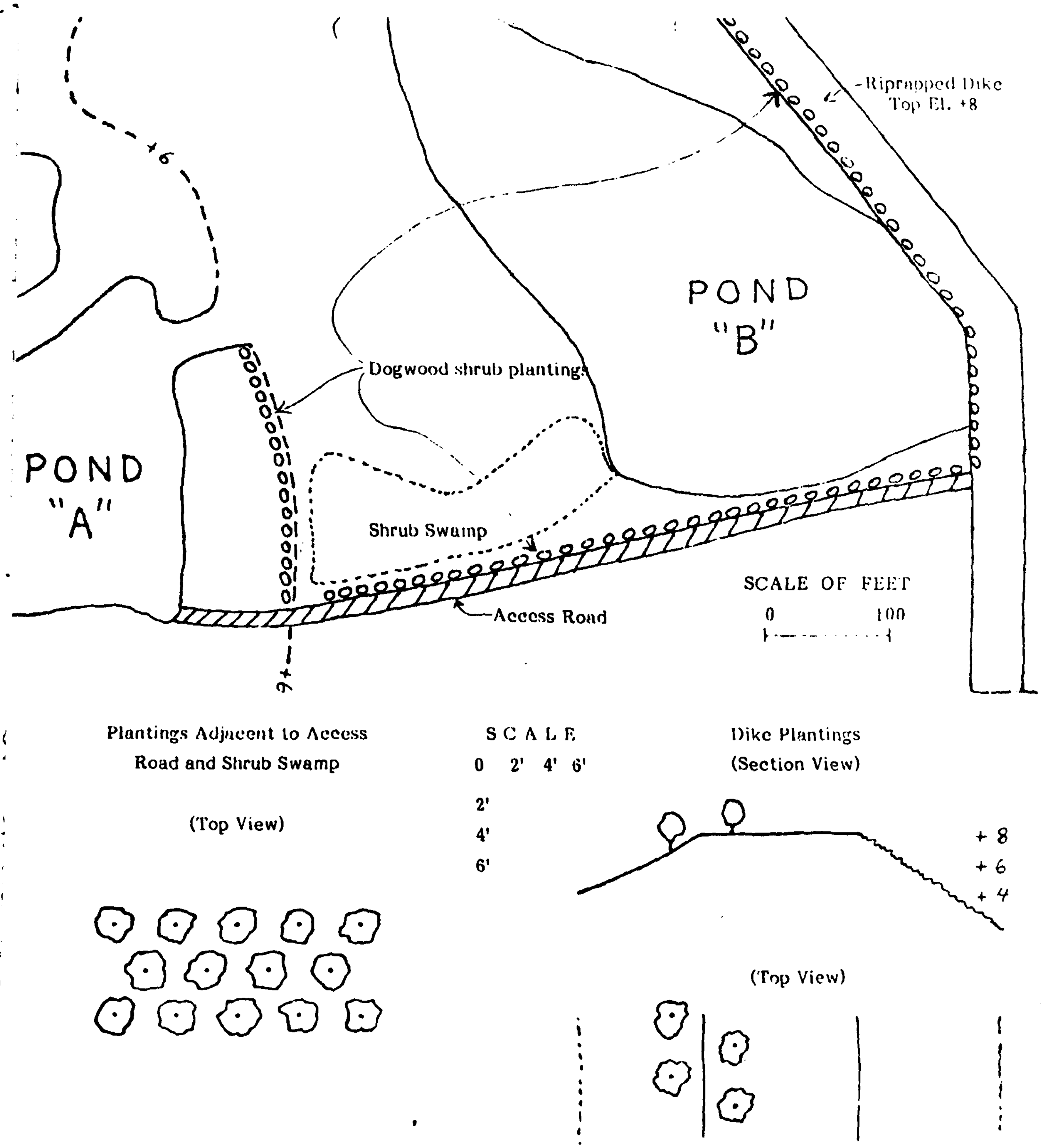


Figure 4. Location and configuration of dogwood shrub plantings

APPENDIX H

PLATES

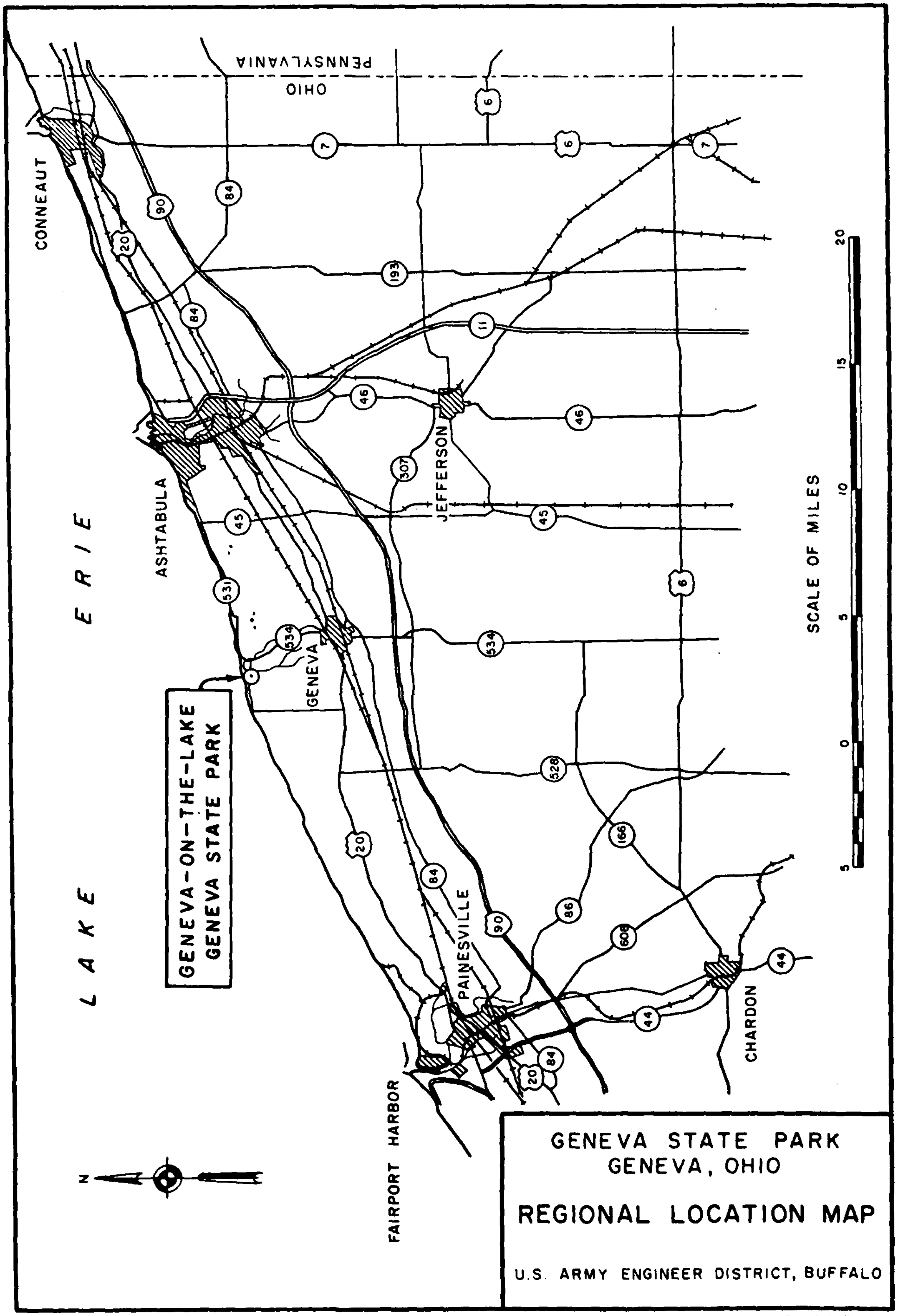
GENEVA-ON-THE-LAKE SMALL-BOAT HARBOR

FINAL REFORMULATION PHASE I GENERAL DESIGN MEMORANDUM

U. S. Army Engineer District, Buffalo
1776 Niagara Street
Buffalo, NY 14207

APPENDIX H

PLATES

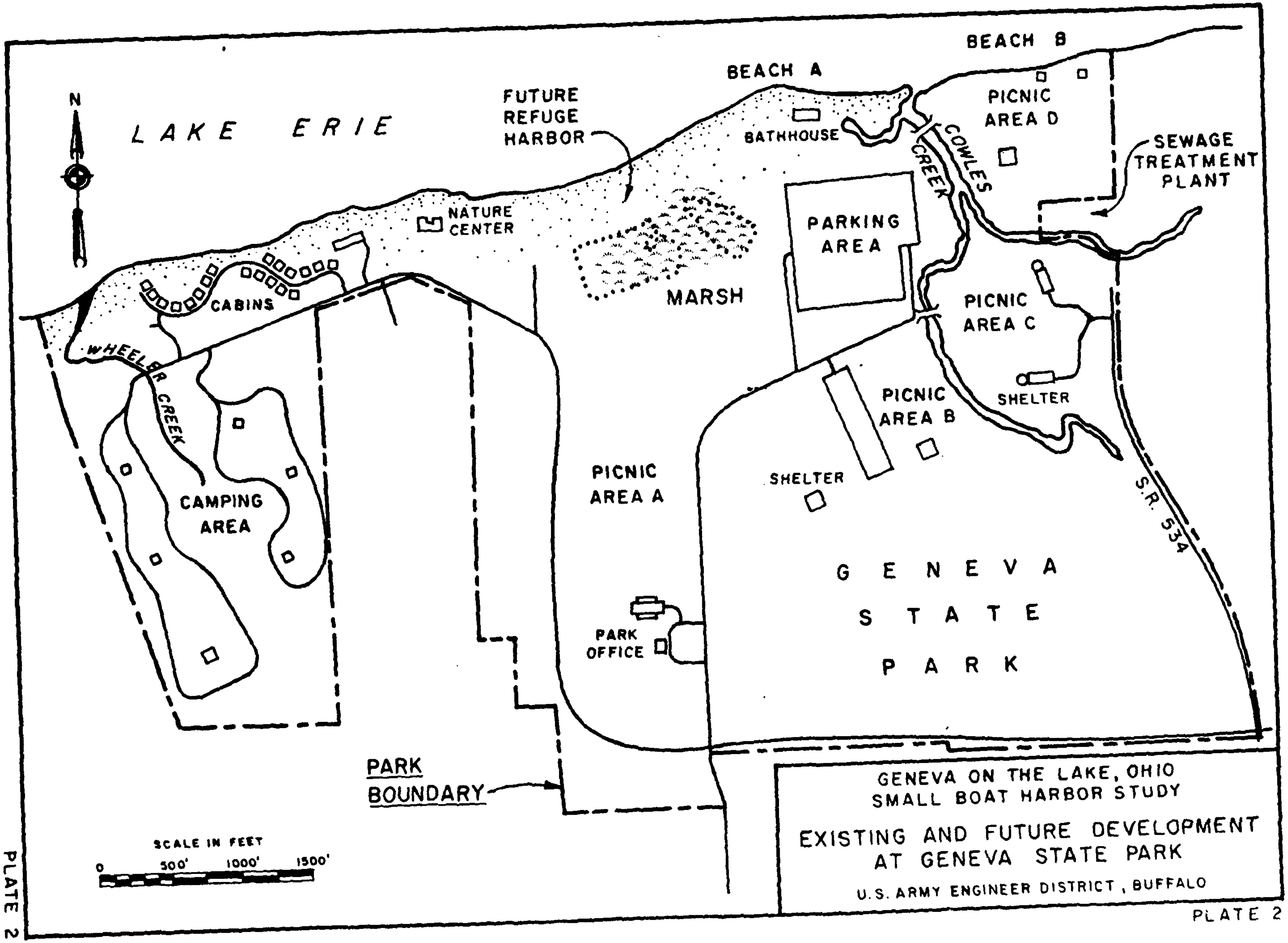


GENEVA STATE PARK
GENEVA, OHIO

REGIONAL LOCATION MAP

U.S. ARMY ENGINEER DISTRICT, BUFFALO

PLATE I



GENEVA ON THE LAKE, OHIO
SMALL BOAT HARBOR STUDY

EXISTING AND FUTURE DEVELOPMENT AT GENEVA STATE PARK

U.S. ARMY ENGINEER DISTRICT, BUFFALO

PLATE 2

PLATE 2

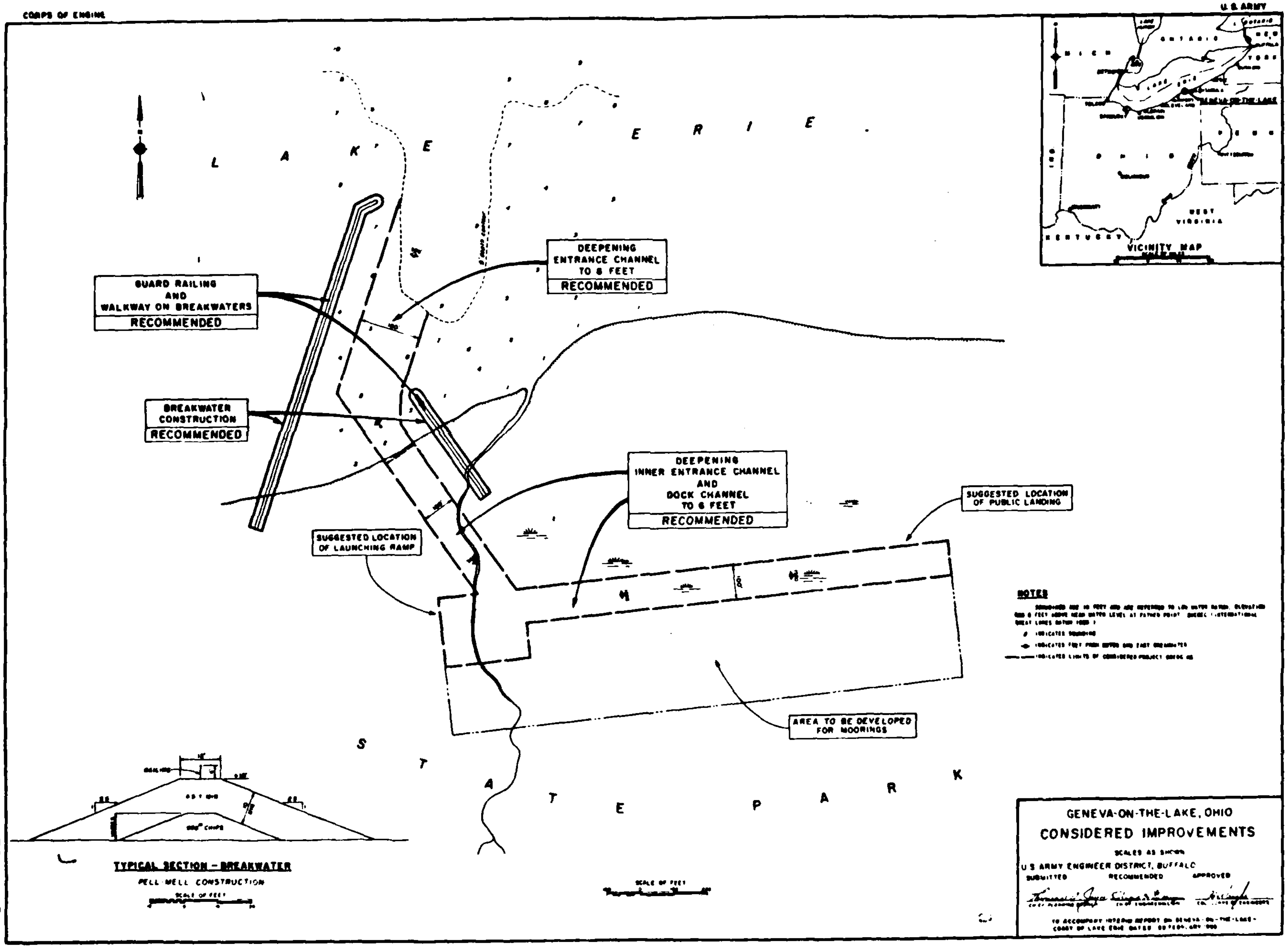
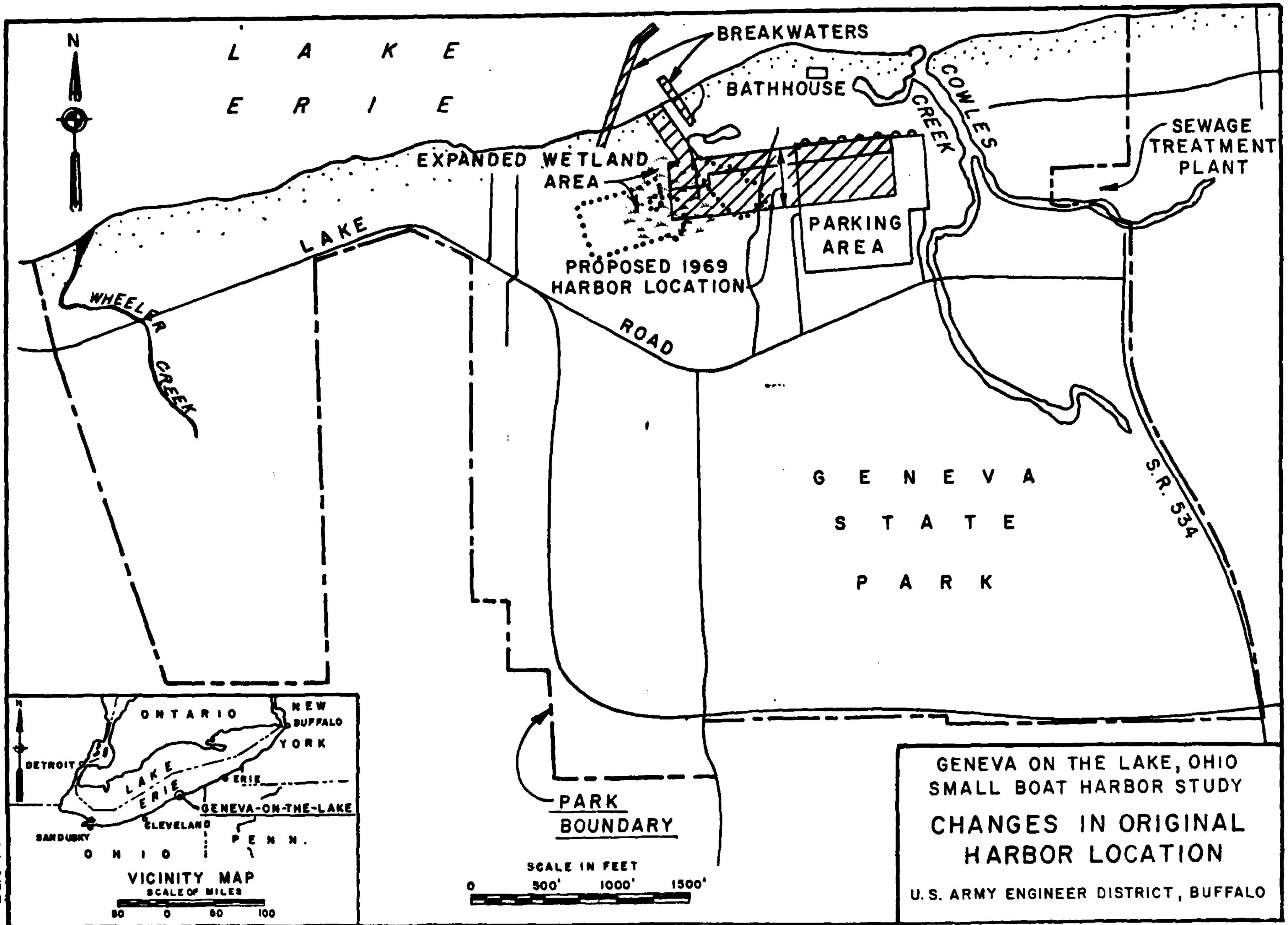

CORPS OF ENGINE
U.S. ARMY
LAKE ERIE
STATE PARK
DEEPENING ENTRANCE CHANNEL TO 6 FEET
RECOMMENDED
GUARD RAILING AND WALKWAY ON BREAKWATERS
RECOMMENDED
BREAKWATER CONSTRUCTION
RECOMMENDED
DEEPENING INNER ENTRANCE CHANNEL AND DOCK CHANNEL TO 6 FEET
RECOMMENDED
SUGGESTED LOCATION OF LAUNCHING RAMP
SUGGESTED LOCATION OF PUBLIC LANDING
AREA TO BE DEVELOPED FOR MOORINGS
NOTES
VICINITY MAP
WEST VIRGINIA
KENTUCKY
TYPICAL SECTION - BREAKWATER
PELL-MELL CONSTRUCTION
SCALE OF FEET
GENEVA-ON-THE-LAKE, OHIO
CONSIDERED IMPROVEMENTS
SCALES AS SHOWN
U.S. ARMY ENGINEER DISTRICT, BUFFALO
SUBMITTED
RECOMMENDED
APPROVED

Plate 3


N
LAKE ERIE
BREAKWATERS
BATHHOUSE
COWLES CREEK
SEWAGE TREATMENT PLANT
EXPANDED WETLAND AREA
PROPOSED 1969 HARBOR LOCATION
PARKING AREA
LAKE ROAD
WHEELER CREEK
GENEVA STATE PARK
S.R. 534
PARK BOUNDARY
SCALE IN FEET
0
500'
1000'
1500'
ONTARIO
NEW YORK
BUFFALO
DETROIT
LAKE ERIE
ERIE
GENEVA-ON-THE-LAKE
CLEVELAND
SANDUSKY
OHIO
PENN.
VICINITY MAP
SCALE OF MILES
50
0
50
100
GENEVA ON THE LAKE, OHIO
SMALL BOAT HARBOR STUDY
CHANGES IN ORIGINAL HARBOR LOCATION
U.S. ARMY ENGINEER DISTRICT, BUFFALO

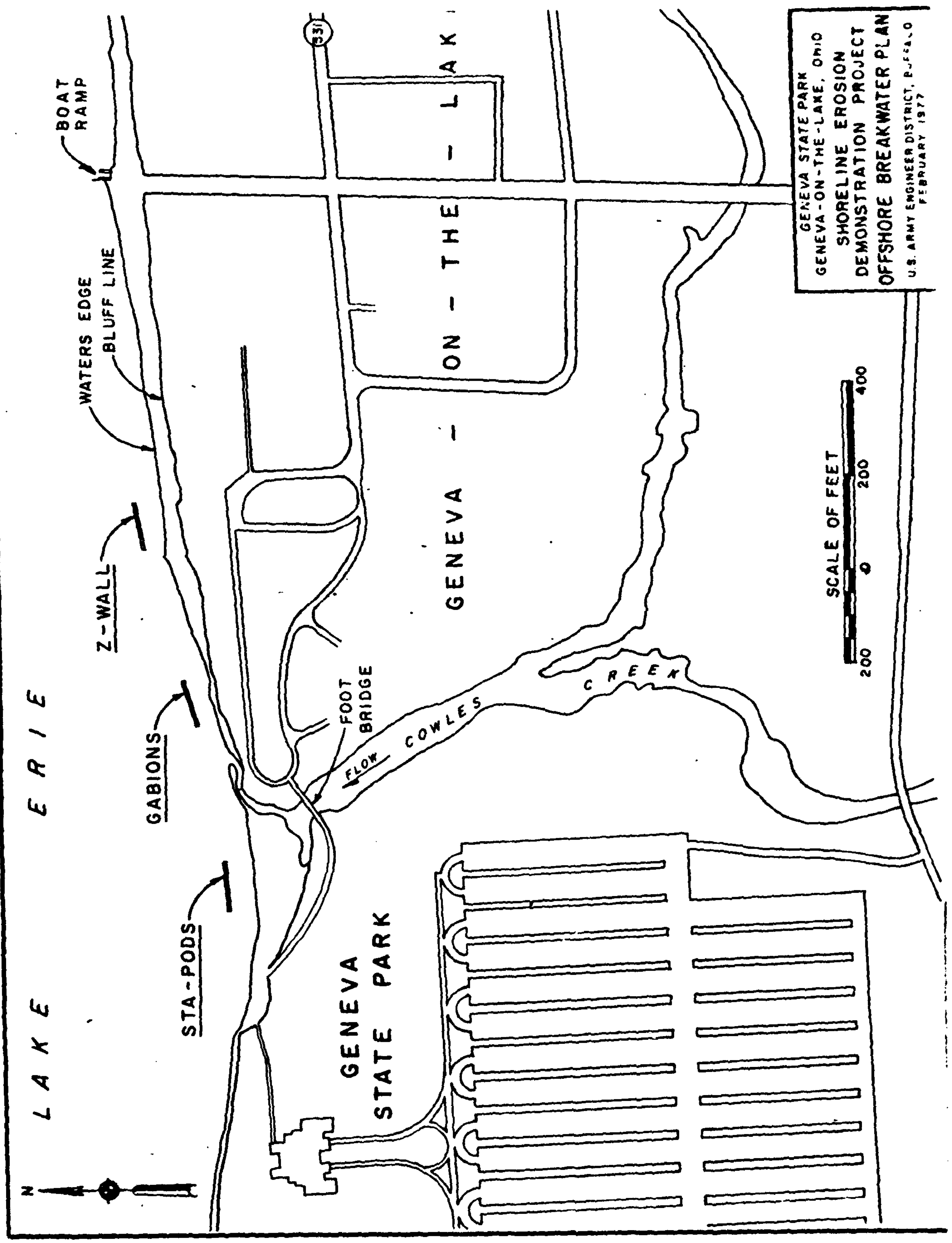

GENEVA STATE PARK
GENEVA-ON-THE-LAKE, OHIO
SHORELINE EROSION
DEMONSTRATION PROJECT
OFFSHORE BREAKWATER PLAN
U.S. ARMY ENGINEER DISTRICT, BUFFALO
FEBRUARY 1977
LAKE ERIE
BOAT RAMP
WATERS EDGE
BLUFF LINE
Z-WALL
GABIONS
STA-PODS
331
GENEVA - ON - THE - LAKE
GENEVA STATE PARK
FOOT BRIDGE
FLOW
COWLES CREEK
SCALE OF FEET
200
0
200
400
N

Plate 5

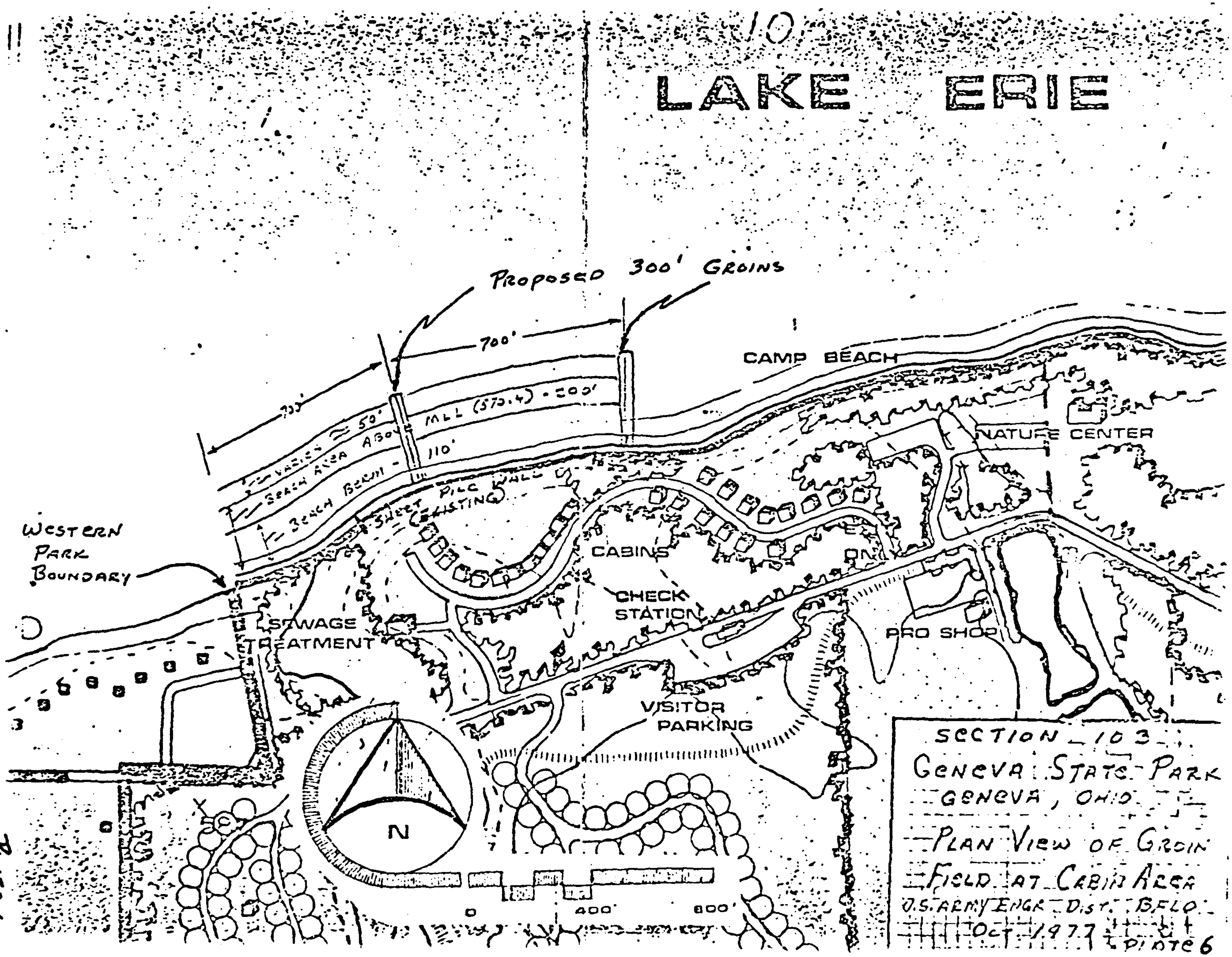

10
LAKE ERIE
PROPOSED 300' GROINS
700'
CAMP BEACH
NATURE CENTER
MLL (573.4) + 200'
110'
50'
BEACH AREA ABOVE
BEACH BERM
SHEET PILE WALL
EXISTING
WESTERN PARK BOUNDARY
CABINS
CHECK STATION
SEWAGE TREATMENT
PRO SHOP
VISITOR PARKING
N
0
400'
800'
SECTION 103
GENEVA STATE PARK
GENEVA, OHIO
PLAN VIEW OF GROIN FIELD AT CABIN AREA
U.S. ARMY ENGR. DIST. BFLO.
OCT. 1977
PLATE 6

PLATE 6

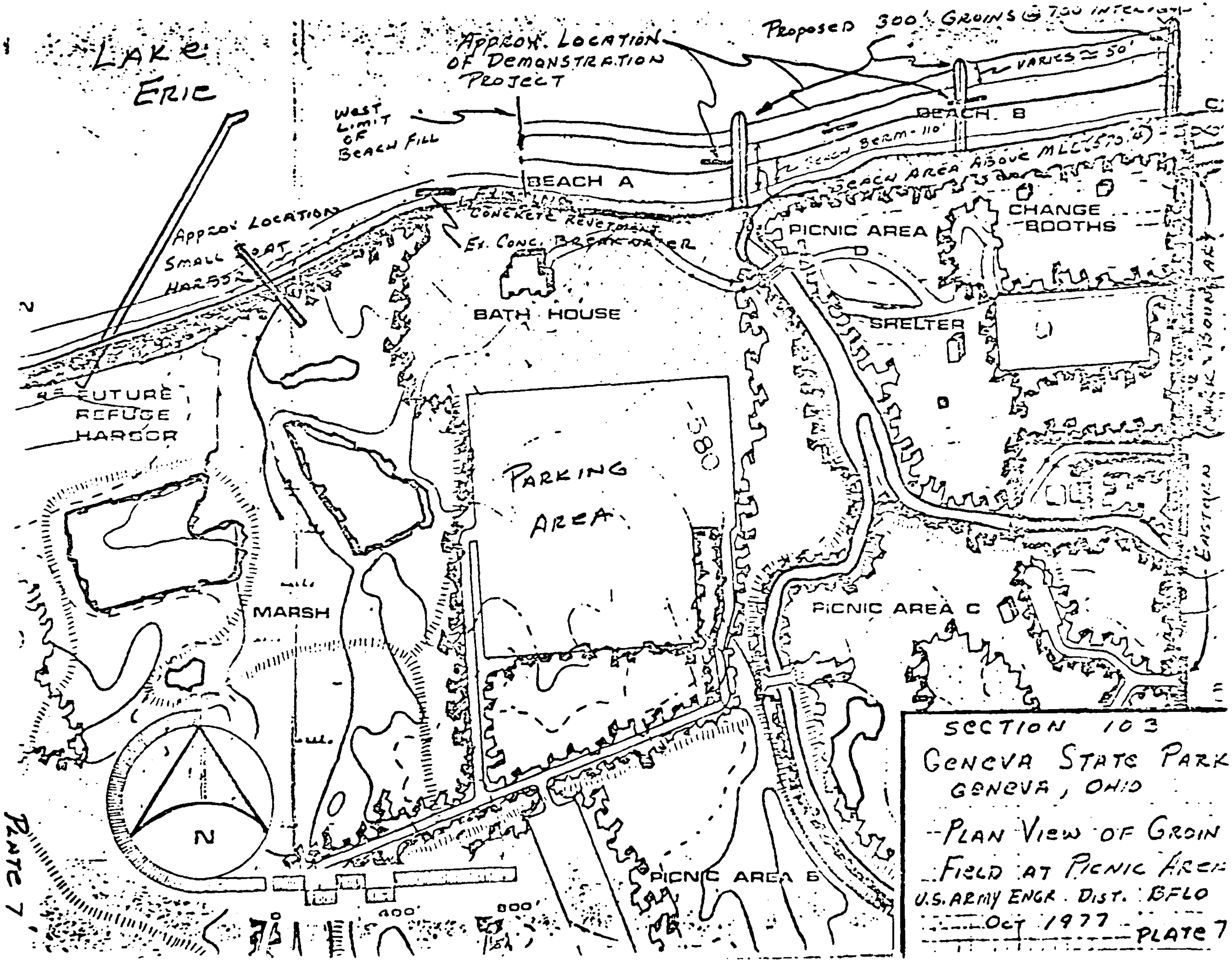
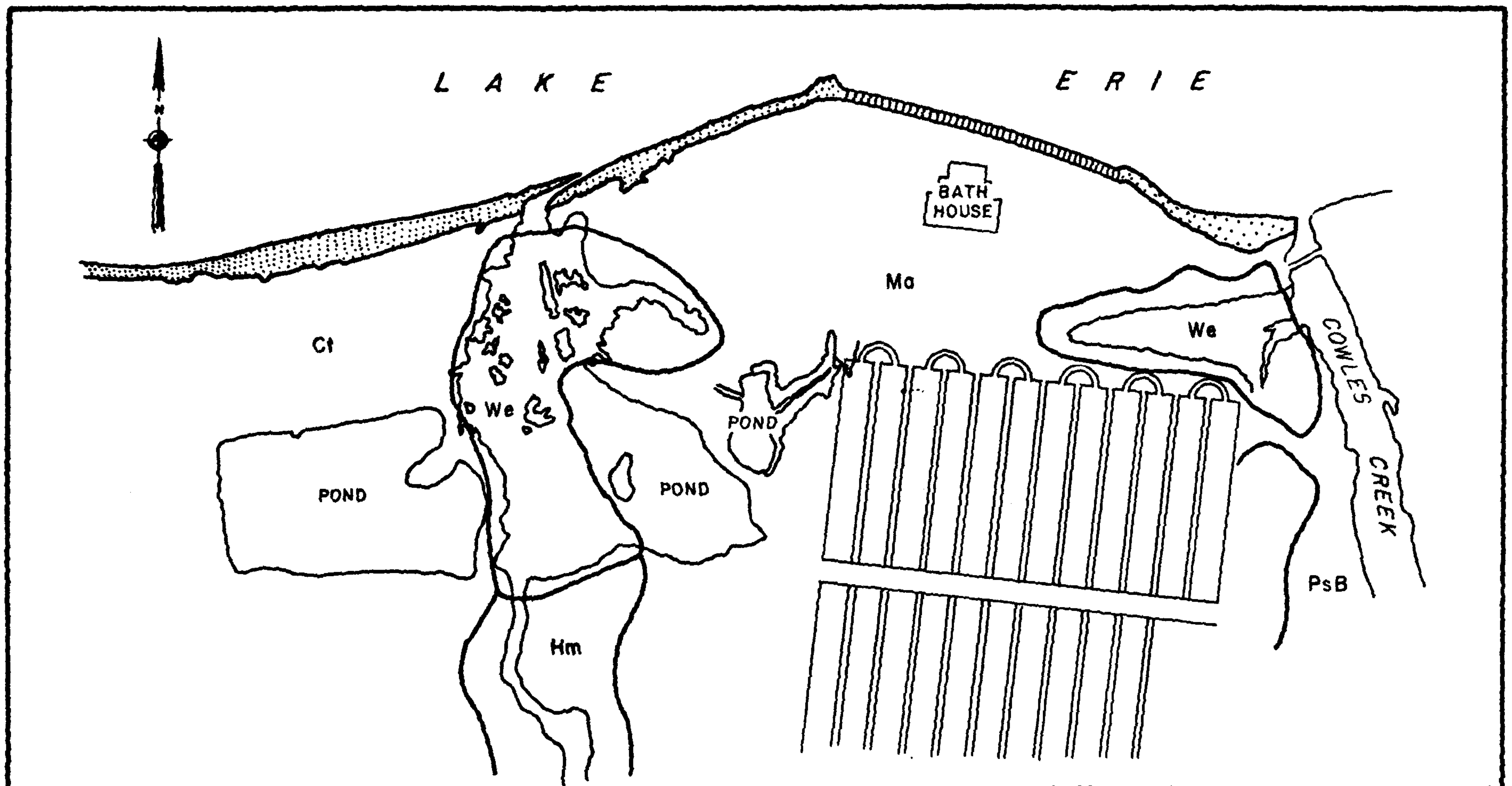

LAKE ERIE
Proposed 300' GROINS @ 750 INTERVAL
VARIES ≈ 50'
APPROX. LOCATION OF DEMONSTRATION PROJECT
WEST LIMIT OF BEACH FILL
BEACH B
BEACH BERM - 110'
BEACH AREA ABOVE MLW
BEACH A
CONCRETE REVETMENT
EX. CONC. BREAKWATER
APPROX. LOCATION SMALL BOAT HARBOR
FUTURE REFUGE HARBOR
PICNIC AREA
CHANGE BOOTHS
BATH HOUSE
SHELTER
580
PARKING AREA
MARSH
PICNIC AREA C
PICNIC AREA B
EASTERN BOUNDARY
N
400'
800'
SECTION 103
GENEVA STATE PARK
GENEVA, OHIO
PLAN VIEW OF GROIN FIELD AT PICNIC AREA
U.S. ARMY ENGR. DIST. BFLO
OCT 1977
PLATE 7

PLATE 7

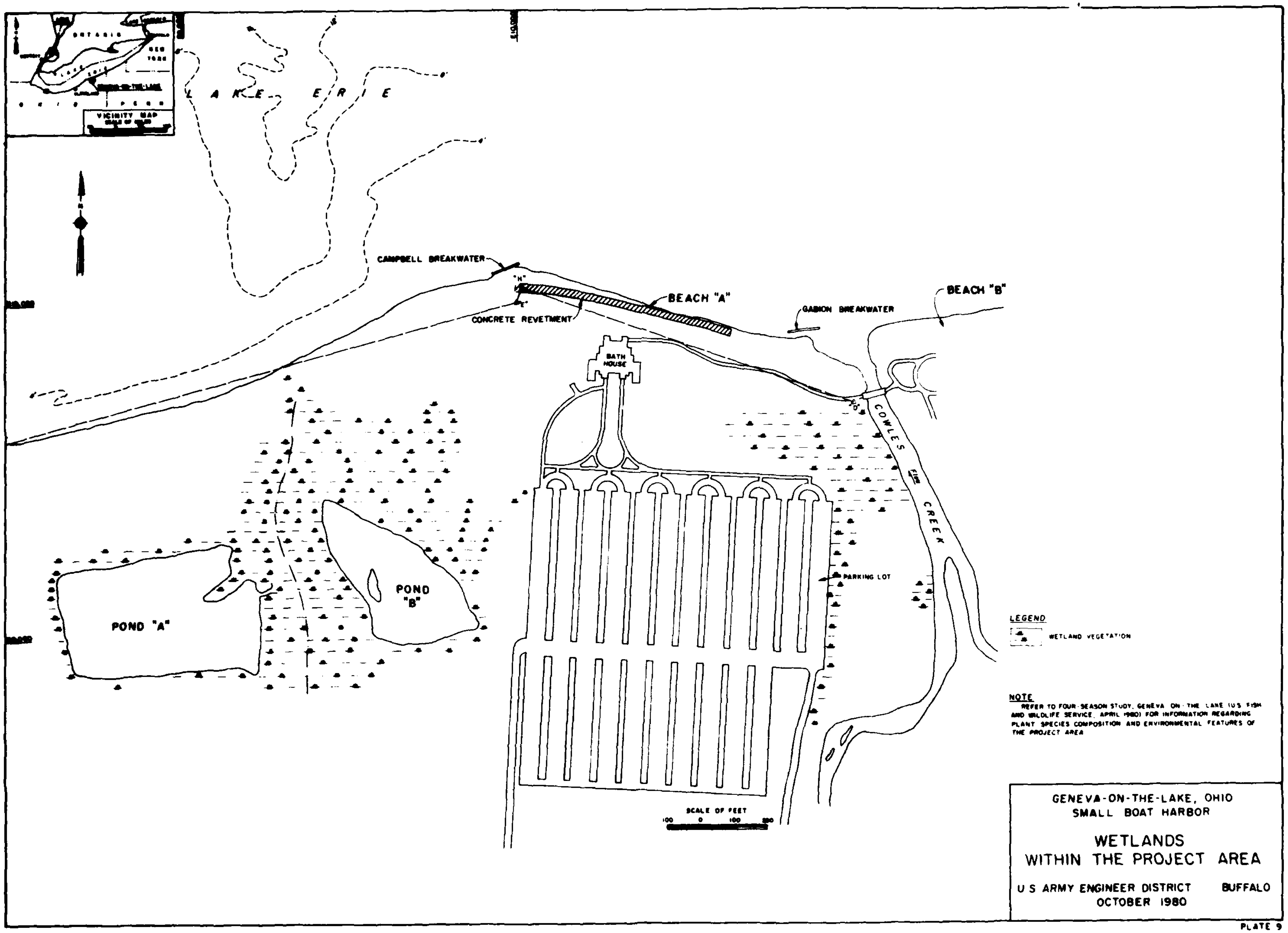


GENEVA-ON-THE-LAKE, OHIO
SMALL BOAT HARBOR STUDY

SOILS MAP

U.S. ARMY ENGINEER DISTRICT BUFFALO

Plate 8



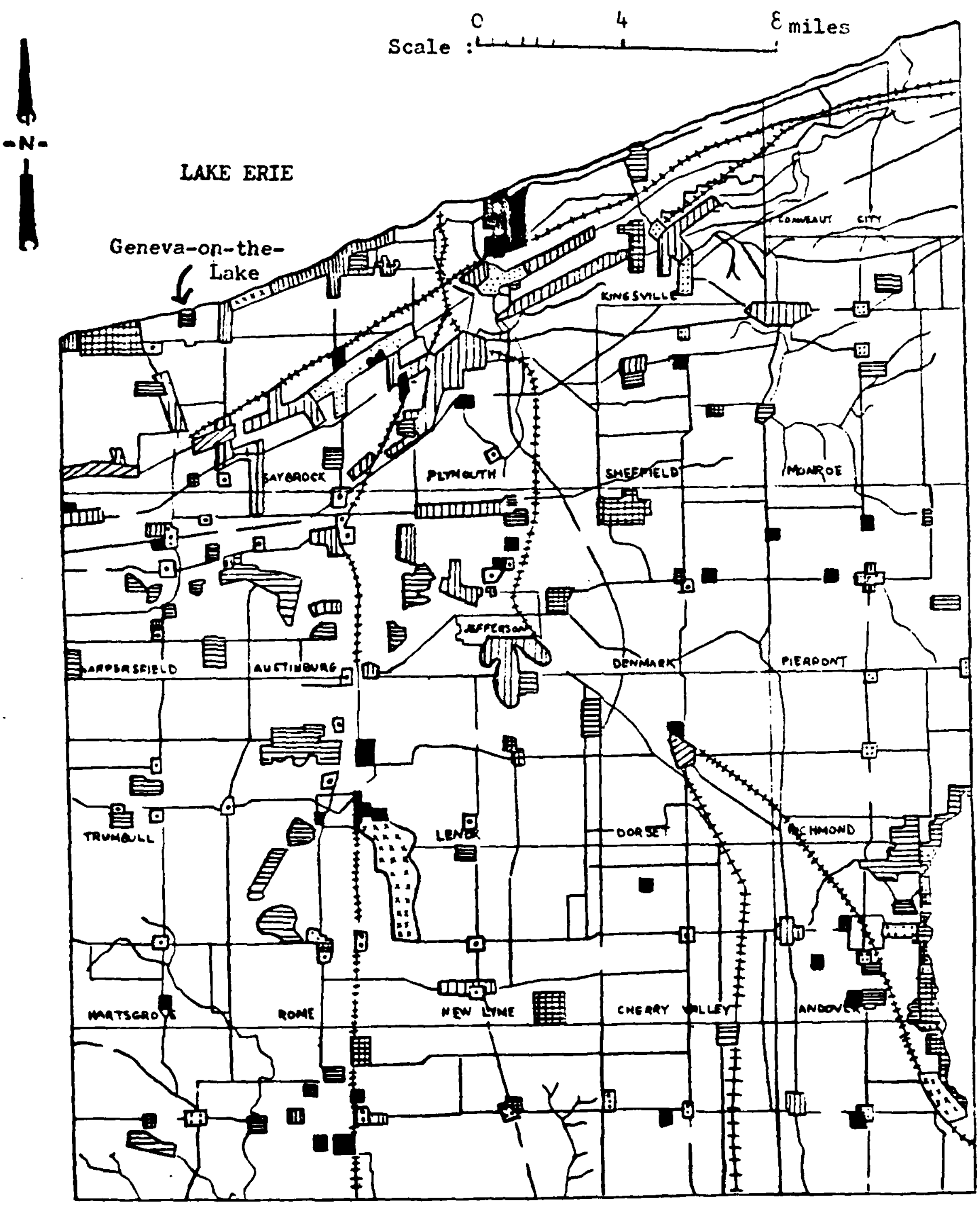
NOTE
REFER TO FOUR-SEASON STUDY, GENEVA-ON-THE-LAKE (U.S. FISH AND WILDLIFE SERVICE, APRIL 1980) FOR INFORMATION REGARDING PLANT SPECIES COMPOSITION AND ENVIRONMENTAL FEATURES OF THE PROJECT AREA

GENEVA-ON-THE-LAKE, OHIO
SMALL BOAT HARBOR

WETLANDS
WITHIN THE PROJECT AREA

U S ARMY ENGINEER DISTRICT BUFFALO
OCTOBER 1980

PLATE 9



KEY

Residential	Recreational-Residential
Recreational	Residential-Commercial
Public	Industrial
Commercial	Agricultural-Rural

Ashtabula County, Ohio

GENERALIZED LAND USE MAP

U.S. Army Engineer District

Plate 10

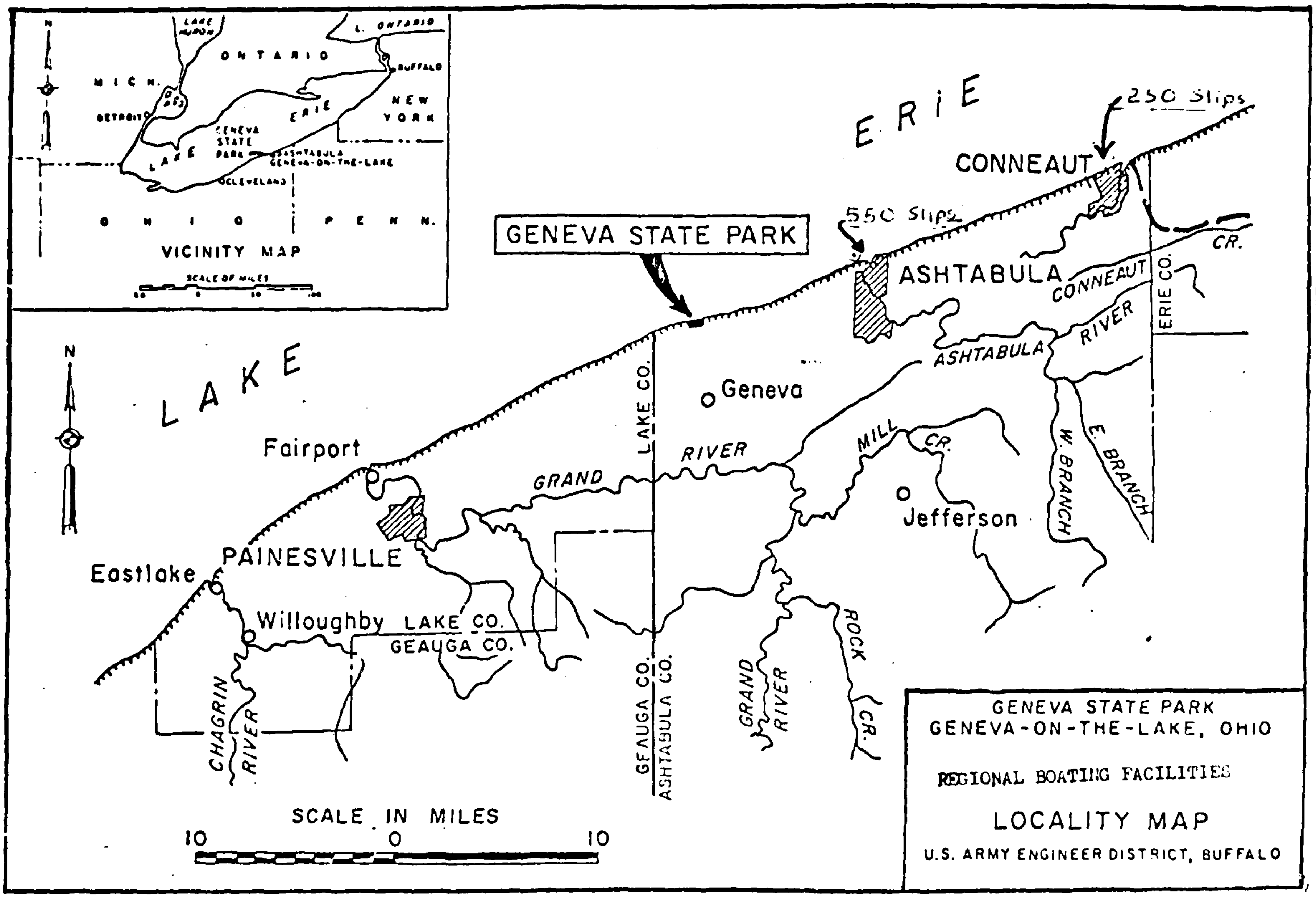
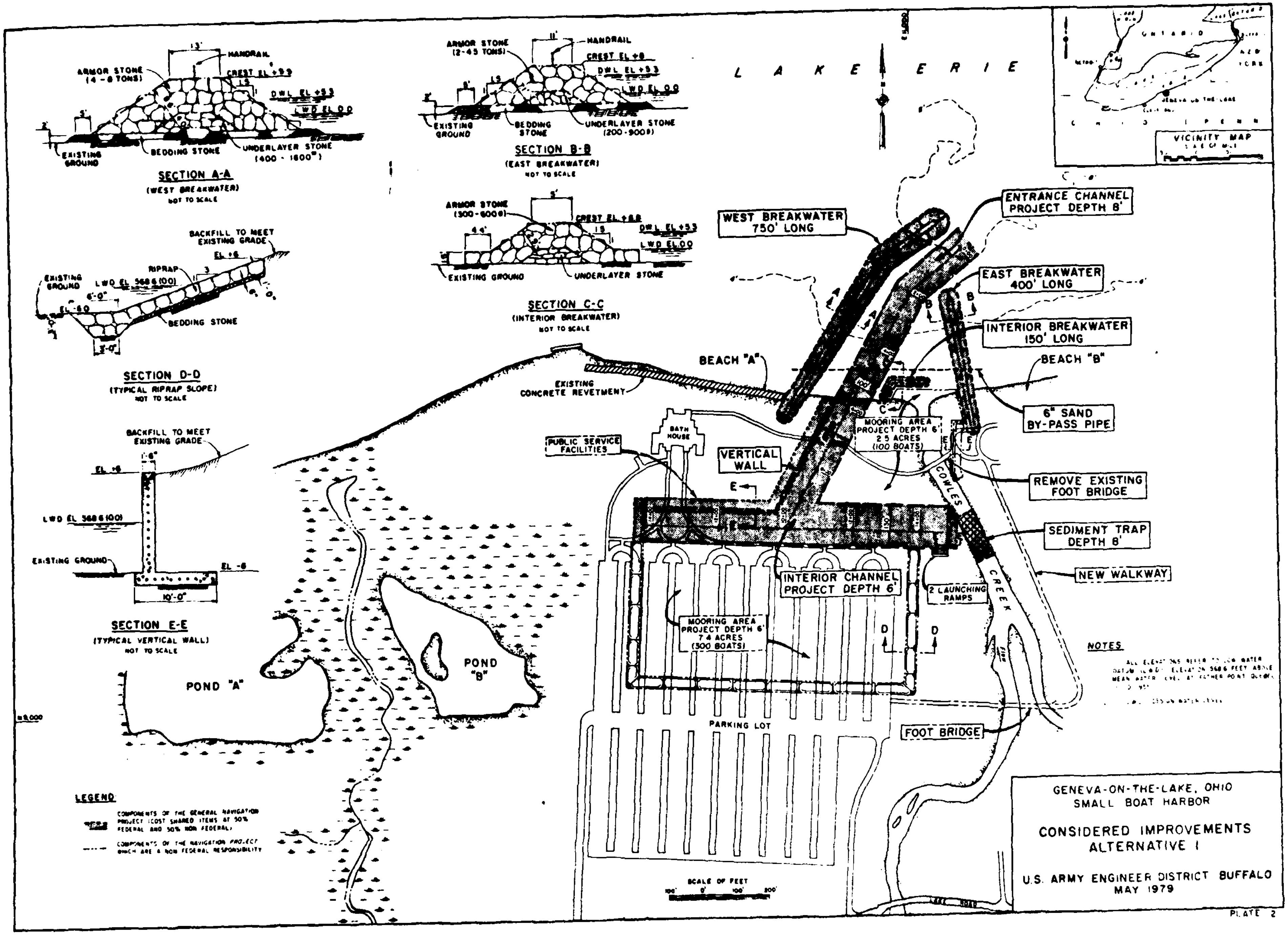

GENEVA STATE PARK
GENEVA-ON-THE-LAKE, OHIO
REGIONAL BOATING FACILITIES
LOCALITY MAP
U.S. ARMY ENGINEER DISTRICT, BUFFALO
VICINITY MAP
ONTARIO
MICH.
NEW YORK
OHIO
PENN.
LAKE ERIE
L. ONTARIO
BUFFALO
DETROIT
CLEVELAND
GENEVA STATE PARK
ASHTABULA
GENEVA-ON-THE-LAKE
SCALE OF MILES
LAKE ERIE
GENEVA STATE PARK
250 Slips
550 Slips
CONNEAUT
ASHTABULA
CONNEAUT CR.
ERIE CO.
ASHTABULA RIVER
W. BRANCH
E. BRANCH
Geneva
Jefferson
MILL CR.
GRAND RIVER
ROCK CR.
LAKE CO.
ASHTABULA CO.
GEAUGA CO.
Fairport
PAINESVILLE
Eastlake
Willoughby
CHAGRIN RIVER
SCALE IN MILES
10
0
10
N

Plate 11



ARMOR STONE (4 - 8 TONS)
HANDRAIL
CREST EL +9.9
DWL EL +5.3
LWD EL 0.0
EXISTING GROUND
BEDDING STONE
UNDERLAYER STONE (400 - 1600#)
SECTION A-A
(WEST BREAKWATER)
NOT TO SCALE
ARMOR STONE (2-4.5 TONS)
CREST EL +8
EXISTING GROUND
UNDERLAYER STONE (200-900#)
SECTION B-B
(EAST BREAKWATER)
NOT TO SCALE
ARMOR STONE (300-600#)
CREST EL +6.8
UNDERLAYER STONE
SECTION C-C
(INTERIOR BREAKWATER)
NOT TO SCALE
BACKFILL TO MEET EXISTING GRADE
RIPRAP
LWD EL 568.6 (0.0)
SECTION D-D
(TYPICAL RIPRAP SLOPE)
NOT TO SCALE
EXISTING GROUND
SECTION E-E
(TYPICAL VERTICAL WALL)
NOT TO SCALE
L A K E E R I E
VICINITY MAP
ONTARIO
NEW YORK
GENEVA-ON-THE-LAKE
WEST BREAKWATER 750' LONG
ENTRANCE CHANNEL PROJECT DEPTH 8'
EAST BREAKWATER 400' LONG
INTERIOR BREAKWATER 150' LONG
BEACH "A"
BEACH "B"
EXISTING CONCRETE REVETMENT
6" SAND BY-PASS PIPE
MOORING AREA PROJECT DEPTH 6' 2.5 ACRES (100 BOATS)
BATH HOUSE
PUBLIC SERVICE FACILITIES
VERTICAL WALL
REMOVE EXISTING FOOT BRIDGE
COWLES CREEK
SEDIMENT TRAP DEPTH 8'
INTERIOR CHANNEL PROJECT DEPTH 6'
2 LAUNCHING RAMPS
NEW WALKWAY
MOORING AREA PROJECT DEPTH 6' 7.4 ACRES (300 BOATS)
POND "A"
POND "B"
PARKING LOT
FOOT BRIDGE
NOTES
LEGEND
COMPONENTS OF THE GENERAL NAVIGATION PROJECT (COST SHARED ITEMS AT 50% FEDERAL AND 50% NON FEDERAL)
COMPONENTS OF THE NAVIGATION PROJECT WHICH ARE A NON FEDERAL RESPONSIBILITY
SCALE OF FEET
100' 0' 100' 200'
GENEVA-ON-THE-LAKE, OHIO
SMALL BOAT HARBOR
CONSIDERED IMPROVEMENTS
ALTERNATIVE I
U.S. ARMY ENGINEER DISTRICT BUFFALO
MAY 1979

PLATE 2

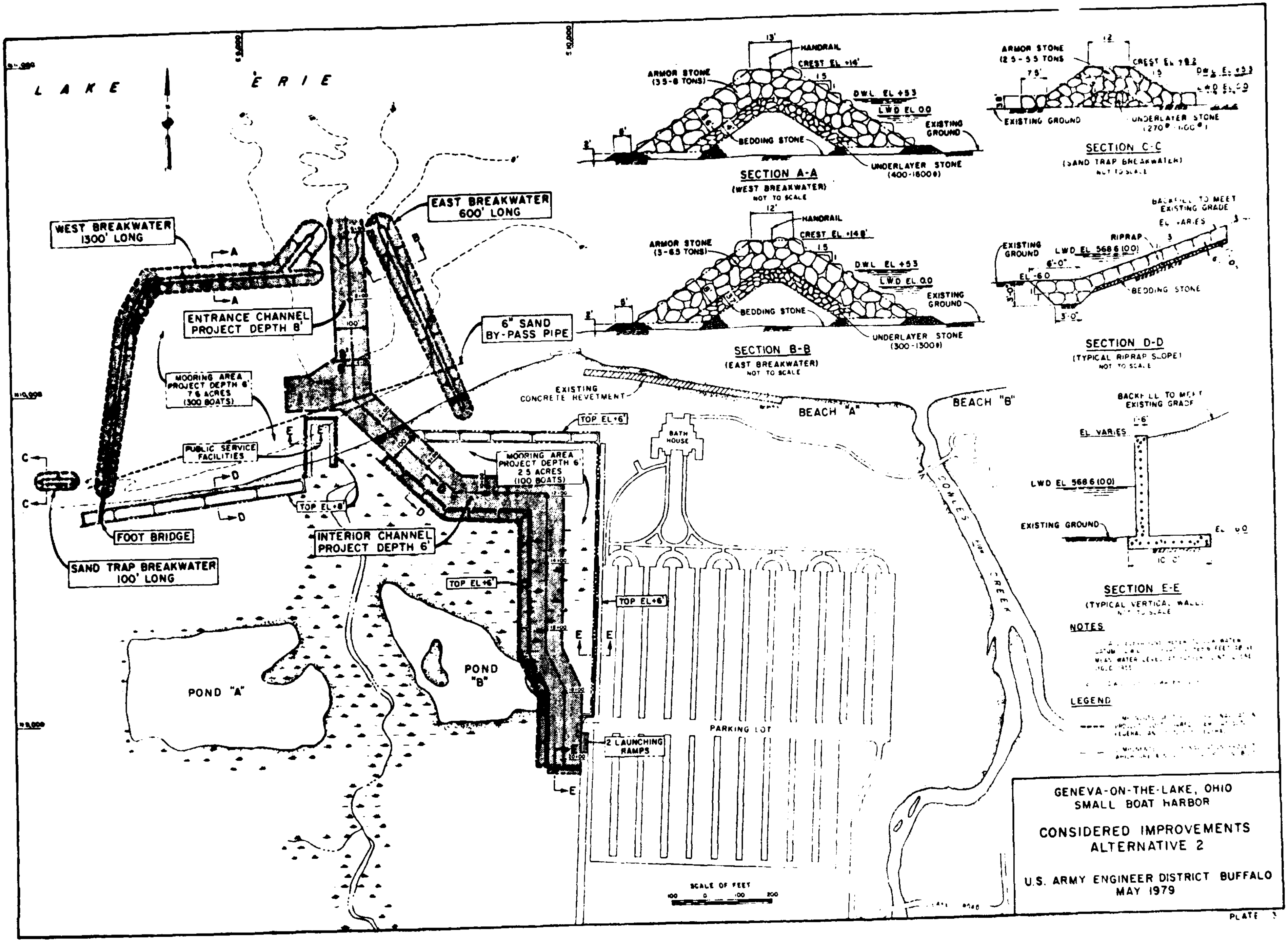
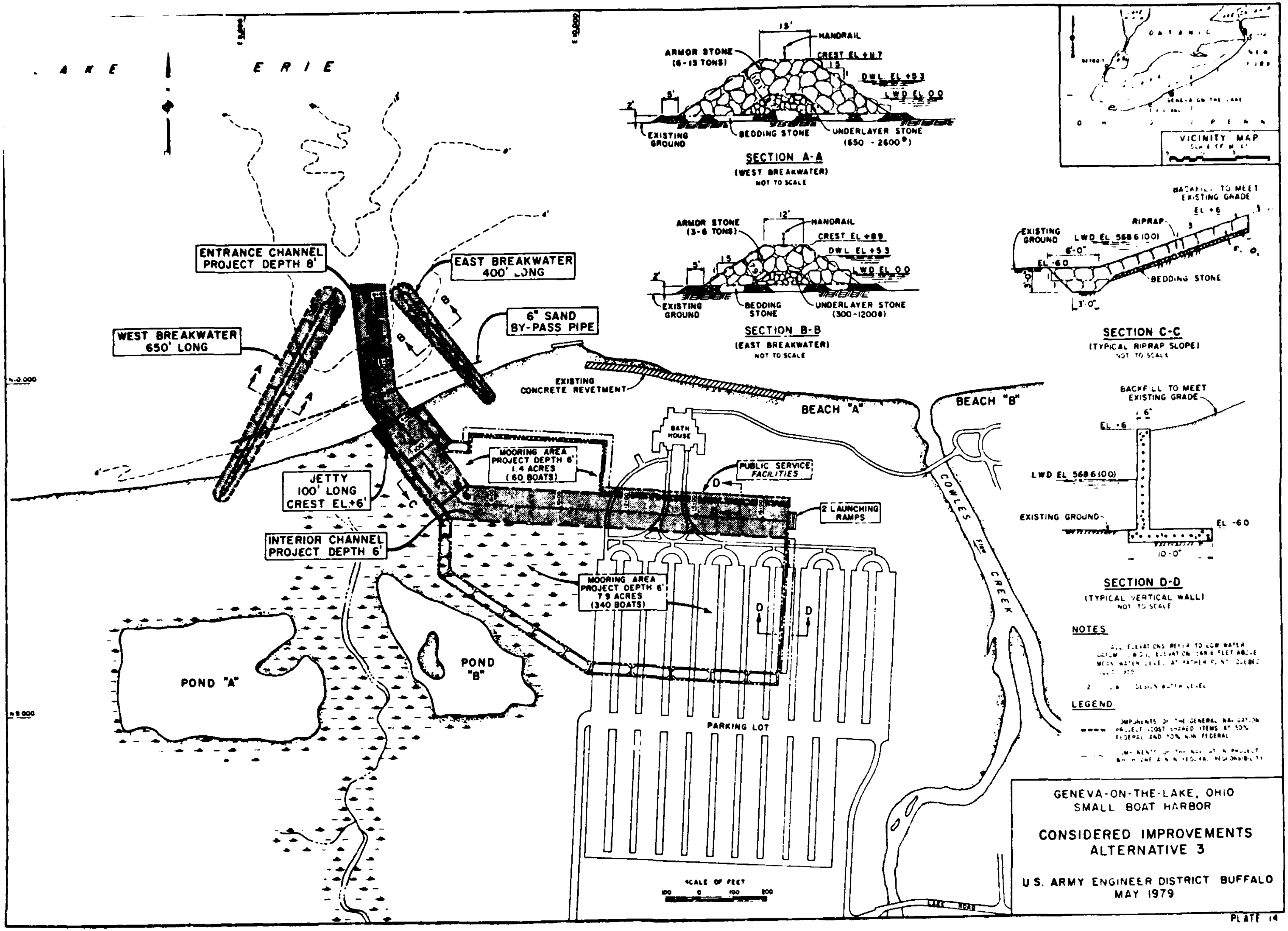

LAKE ERIE
WEST BREAKWATER 1300' LONG
EAST BREAKWATER 600' LONG
ENTRANCE CHANNEL PROJECT DEPTH 8'
6" SAND BY-PASS PIPE
MOORING AREA PROJECT DEPTH 6' 7.6 ACRES (300 BOATS)
PUBLIC SERVICE FACILITIES
FOOT BRIDGE
SAND TRAP BREAKWATER 100' LONG
INTERIOR CHANNEL PROJECT DEPTH 6'
MOORING AREA PROJECT DEPTH 6' 2.5 ACRES (100 BOATS)
EXISTING CONCRETE REVETMENT
TOP EL+6'
TOP EL+8'
BEACH "A"
BEACH "B"
BATH HOUSE
COWLES CREEK
POND "A"
POND "B"
PARKING LOT
2 LAUNCHING RAMPS
SCALE OF FEET
100 0 100 200
ARMOR STONE (3.5-6 TONS)
HANDRAIL
CREST EL +14'
DWL EL +5.3
LWD EL 0.0
EXISTING GROUND
BEDDING STONE
UNDERLAYER STONE (400-1600#)
SECTION A-A
(WEST BREAKWATER)
NOT TO SCALE
ARMOR STONE (3-6.5 TONS)
CREST EL +14.8'
UNDERLAYER STONE (300-1300#)
SECTION B-B
(EAST BREAKWATER)
NOT TO SCALE
ARMOR STONE (2.5-5.5 TONS)
CREST EL +8.2
EXISTING GROUND
SECTION C-C
(SAND TRAP BREAKWATER)
RIPRAP
LWD EL 568.6 (0.0)
EL -6.0
BEDDING STONE
SECTION D-D
(TYPICAL RIPRAP SLOPE)
BACKFILL TO MEET EXISTING GRADE
EL VARIES
SECTION E-E
(TYPICAL VERTICAL WALL)
NOTES
LEGEND
GENEVA-ON-THE-LAKE, OHIO
SMALL BOAT HARBOR
CONSIDERED IMPROVEMENTS
ALTERNATIVE 2
U.S. ARMY ENGINEER DISTRICT BUFFALO
MAY 1979

PLATE 3

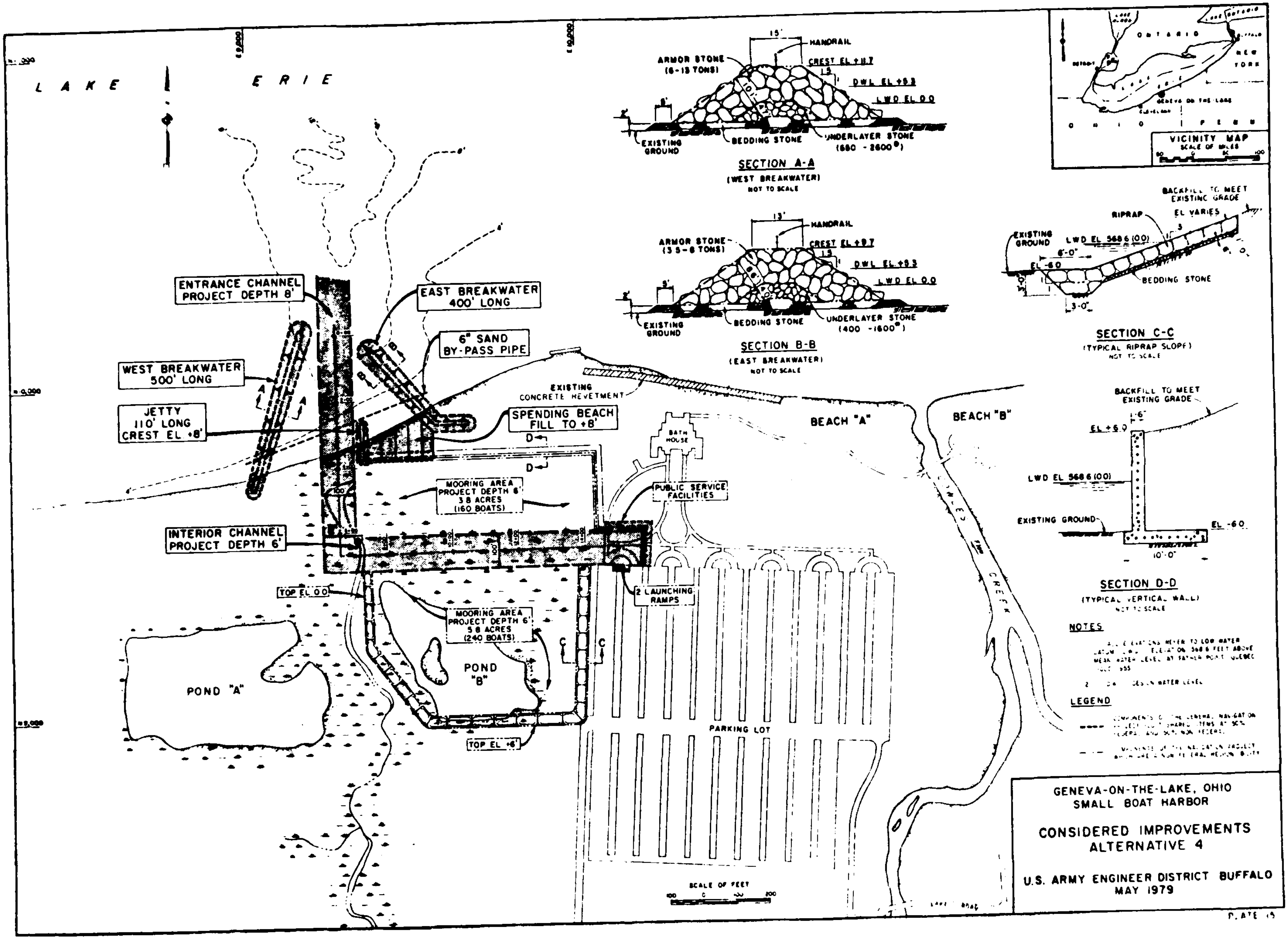


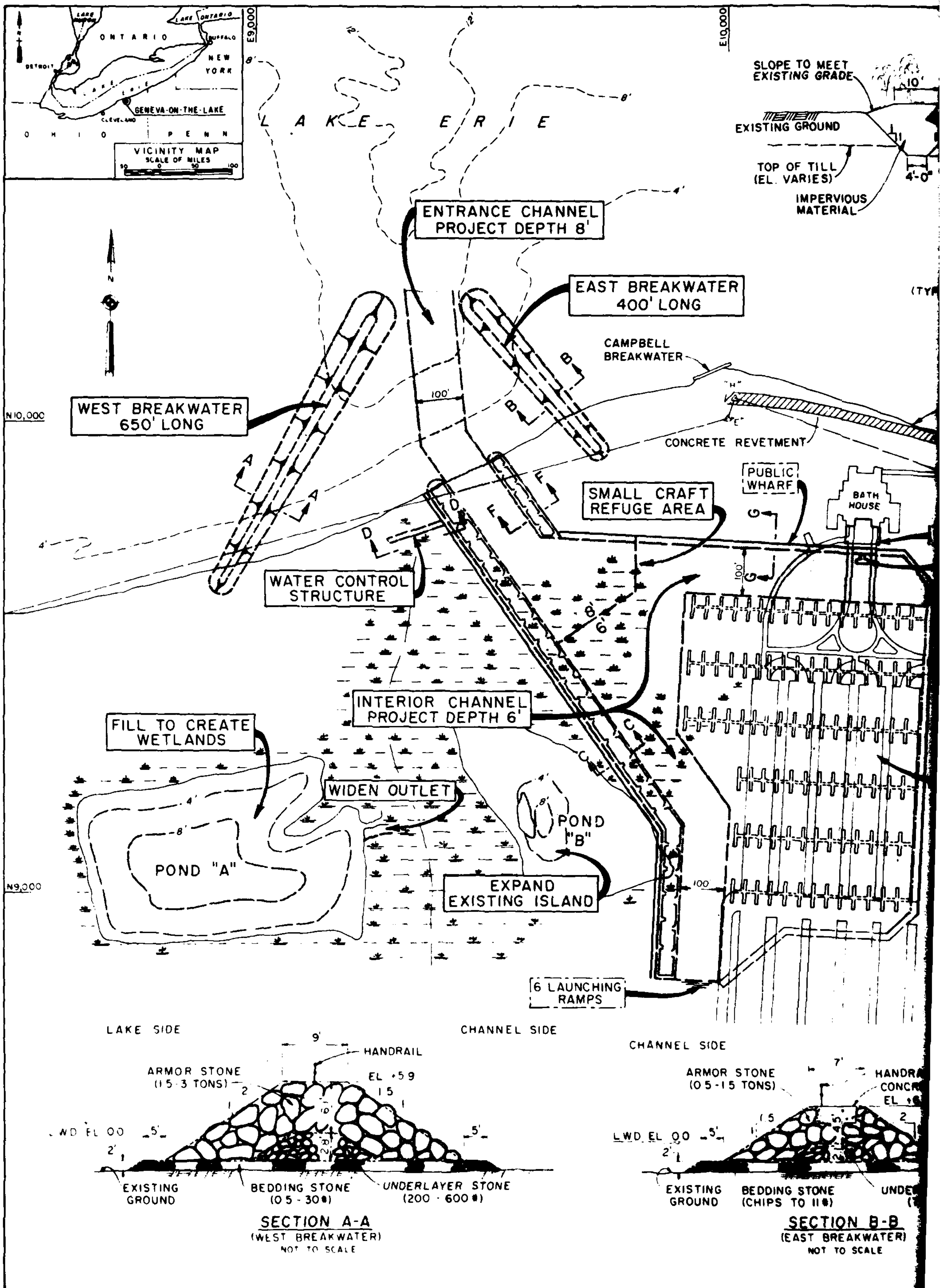
GENEVA-ON-THE-LAKE, OHIO
SMALL BOAT HARBOR

CONSIDERED IMPROVEMENTS
ALTERNATIVE 3

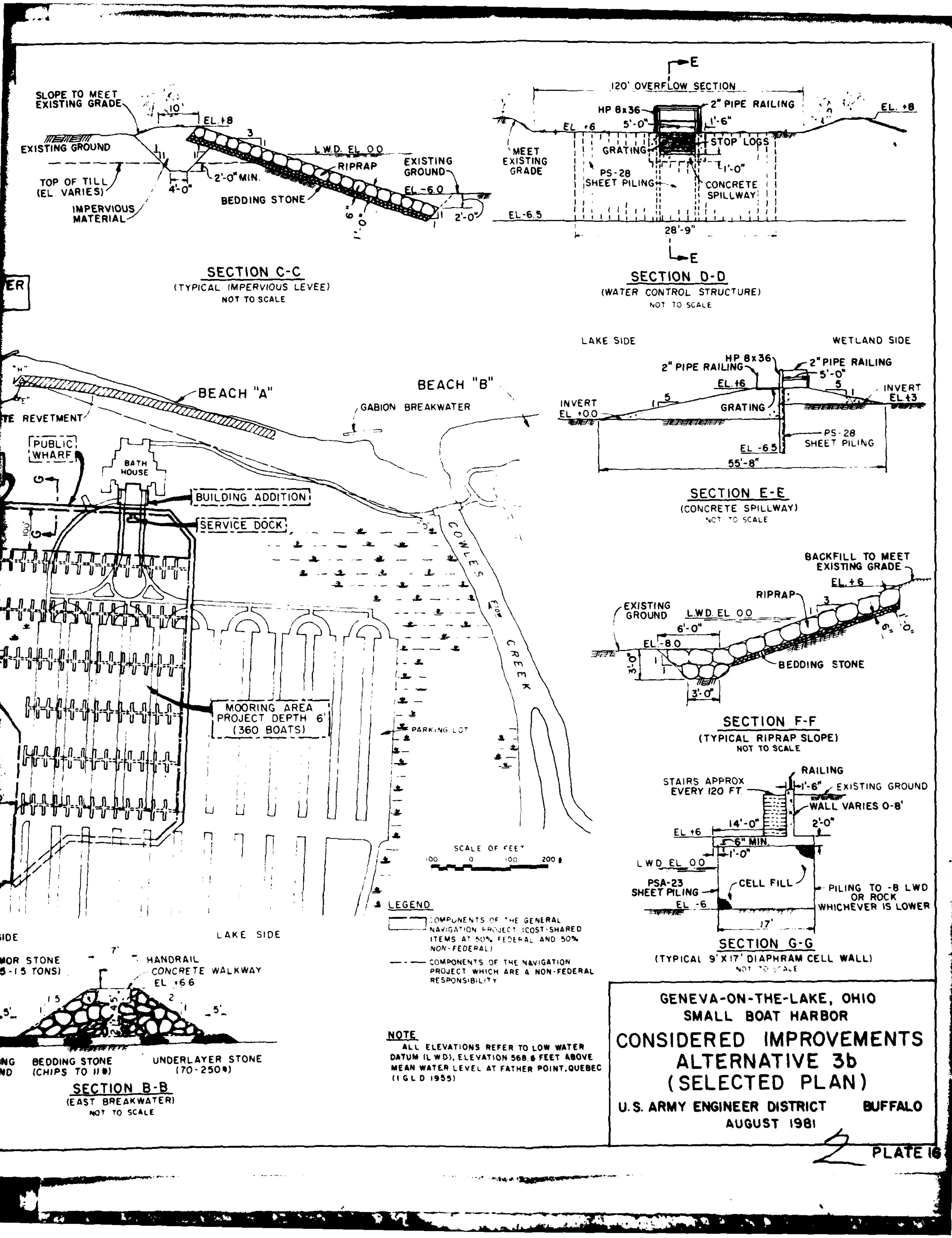
U.S. ARMY ENGINEER DISTRICT BUFFALO
MAY 1979

PLATE 14


LAKE ERIE
ENTRANCE CHANNEL PROJECT DEPTH 8'
EAST BREAKWATER 400' LONG
6" SAND BY-PASS PIPE
WEST BREAKWATER 500' LONG
JETTY 110' LONG CREST EL +8'
EXISTING CONCRETE REVETMENT
SPENDING BEACH FILL TO +8'
BEACH "A"
BEACH "B"
BATH HOUSE
PUBLIC SERVICE FACILITIES
MOORING AREA PROJECT DEPTH 6' 3.8 ACRES (160 BOATS)
INTERIOR CHANNEL PROJECT DEPTH 6'
2 LAUNCHING RAMPS
TOP EL 0.0
MOORING AREA PROJECT DEPTH 6' 5.8 ACRES (240 BOATS)
POND "A"
POND "B"
TOP EL +6'
PARKING LOT
SCALE OF FEET
ARMOR STONE (6-13 TONS)
HANDRAIL
CREST EL +11.7
DWL EL +9.3
LWD EL 0.0
EXISTING GROUND
BEDDING STONE
UNDERLAYER STONE (680 - 2600#)
SECTION A-A
(WEST BREAKWATER)
NOT TO SCALE
ARMOR STONE (3.5-6 TONS)
CREST EL +9.7
UNDERLAYER STONE (400 - 1600#)
SECTION B-B
(EAST BREAKWATER)
NOT TO SCALE
VICINITY MAP
ONTARIO
NEW YORK
GENEVA ON THE LAKE
CLEVELAND
DETROIT
OHIO
PENN
BACKFILL TO MEET EXISTING GRADE
EL VARIES
RIPRAP
LWD EL 568.6 (00)
EL -6.0
SECTION C-C
(TYPICAL RIPRAP SLOPE)
NOT TO SCALE
EL +6.0
SECTION D-D
(TYPICAL VERTICAL WALL)
NOT TO SCALE
NOTES
LEGEND
GENEVA-ON-THE-LAKE, OHIO
SMALL BOAT HARBOR
CONSIDERED IMPROVEMENTS
ALTERNATIVE 4
U.S. ARMY ENGINEER DISTRICT BUFFALO
MAY 1979
PLATE 19



VICINITY MAP
SCALE OF MILES
ONTARIO
NEW YORK
GENEVA-ON-THE-LAKE
CLEVELAND
OHIO
PENN
DETROIT
BUFFALO
LAKE ONTARIO
E9,000
E10,000
N10,000
N9,000
LAKE ERIE
ENTRANCE CHANNEL PROJECT DEPTH 8'
EAST BREAKWATER 400' LONG
WEST BREAKWATER 650' LONG
CAMPBELL BREAKWATER
CONCRETE REVETMENT
PUBLIC WHARF
BATH HOUSE
SMALL CRAFT REFUGE AREA
WATER CONTROL STRUCTURE
INTERIOR CHANNEL PROJECT DEPTH 6'
FILL TO CREATE WETLANDS
WIDEN OUTLET
POND "A"
POND "B"
EXPAND EXISTING ISLAND
6 LAUNCHING RAMPS
SLOPE TO MEET EXISTING GRADE
EXISTING GROUND
TOP OF TILL (EL. VARIES)
IMPERVIOUS MATERIAL
LAKE SIDE
CHANNEL SIDE
HANDRAIL
ARMOR STONE (1.5-3 TONS)
EL +5.9
LWD EL 0.0
EXISTING GROUND
BEDDING STONE (0.5-30#)
UNDERLAYER STONE (200-600#)
SECTION A-A
(WEST BREAKWATER)
NOT TO SCALE
CHANNEL SIDE
ARMOR STONE (0.5-1.5 TONS)
LWD EL 0.0
EXISTING GROUND
BEDDING STONE (CHIPS TO 11#)
SECTION B-B
(EAST BREAKWATER)
NOT TO SCALE


SECTION C-C
(TYPICAL IMPERVIOUS LEVEE)
NOT TO SCALE
SLOPE TO MEET EXISTING GRADE
10'
EL.+8
3
EXISTING GROUND
L.W.D. EL 0.0
EXISTING GROUND
RIPRAP
TOP OF TILL (EL. VARIES)
2'-0" MIN.
4'-0"
EL.-6.0
IMPERVIOUS MATERIAL
BEDDING STONE
6"
1'-0"
2'-0"
SECTION D-D
(WATER CONTROL STRUCTURE)
NOT TO SCALE
E
120' OVERFLOW SECTION
HP 8x36
2" PIPE RAILING
EL. +8
EL +6
5'-0"
1'-6"
STOP LOGS
MEET EXISTING GRADE
GRATING
1'-0"
PS-28 SHEET PILING
CONCRETE SPILLWAY
EL-6.5
28'-9"
SECTION E-E
(CONCRETE SPILLWAY)
NOT TO SCALE
LAKE SIDE
WETLAND SIDE
HP 8x36
2" PIPE RAILING
2" PIPE RAILING
5'-0"
EL.+6
5
INVERT EL +3
INVERT EL +0.0
GRATING
PS-28 SHEET PILING
EL -6.5
55'-8"
BEACH "A"
BEACH "B"
GABION BREAKWATER
REVETMENT
PUBLIC WHARF
BATH HOUSE
BUILDING ADDITION
SERVICE DOCK
100'
G
COWLES CREEK
FLOW
MOORING AREA PROJECT DEPTH 6' (360 BOATS)
PARKING LOT
SCALE OF FEET
100 0 100 200
LEGEND
COMPONENTS OF THE GENERAL NAVIGATION PROJECT (COST-SHARED ITEMS AT 50% FEDERAL AND 50% NON-FEDERAL)
COMPONENTS OF THE NAVIGATION PROJECT WHICH ARE A NON-FEDERAL RESPONSIBILITY
SECTION F-F
(TYPICAL RIPRAP SLOPE)
NOT TO SCALE
BACKFILL TO MEET EXISTING GRADE
EL. +6
RIPRAP
3
EXISTING GROUND
L.W.D. EL 0.0
6'-0"
EL -8.0
3'-0"
3'-0"
BEDDING STONE
6"
1'-0"
SECTION G-G
(TYPICAL 9'X17' DIAPHRAM CELL WALL)
NOT TO SCALE
RAILING
STAIRS APPROX EVERY 120 FT.
1'-6"
EXISTING GROUND
WALL VARIES 0-8'
14'-0"
2'-0"
EL +6
6" MIN.
1'-0"
L.W.D. EL 0.0
PSA-23 SHEET PILING
CELL FILL
PILING TO -8 LWD OR ROCK WHICHEVER IS LOWER
EL -6
17'
SECTION B-B
(EAST BREAKWATER)
NOT TO SCALE
SIDE
LAKE SIDE
ARMOR STONE
(.5-1.5 TONS)
7'
HANDRAIL
CONCRETE WALKWAY
EL +6.6
1.5
2
5'
5'
BEDDING STONE (CHIPS TO 11#)
UNDERLAYER STONE (70-250#)
NOTE
ALL ELEVATIONS REFER TO LOW WATER DATUM (L.W.D.), ELEVATION 568.6 FEET ABOVE MEAN WATER LEVEL AT FATHER POINT, QUEBEC (I.G.L.D. 1955)
GENEVA-ON-THE-LAKE, OHIO
SMALL BOAT HARBOR
CONSIDERED IMPROVEMENTS
ALTERNATIVE 3b
(SELECTED PLAN)
U.S. ARMY ENGINEER DISTRICT BUFFALO
AUGUST 1981
PLATE 16

END

DATE
FILMED

10-88

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GENEVA-ON-THE-LAKE, OHIO. SMALL-BOAT HARBOR. FINAL REFORMULATIO--ETC(U)
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8 of 8
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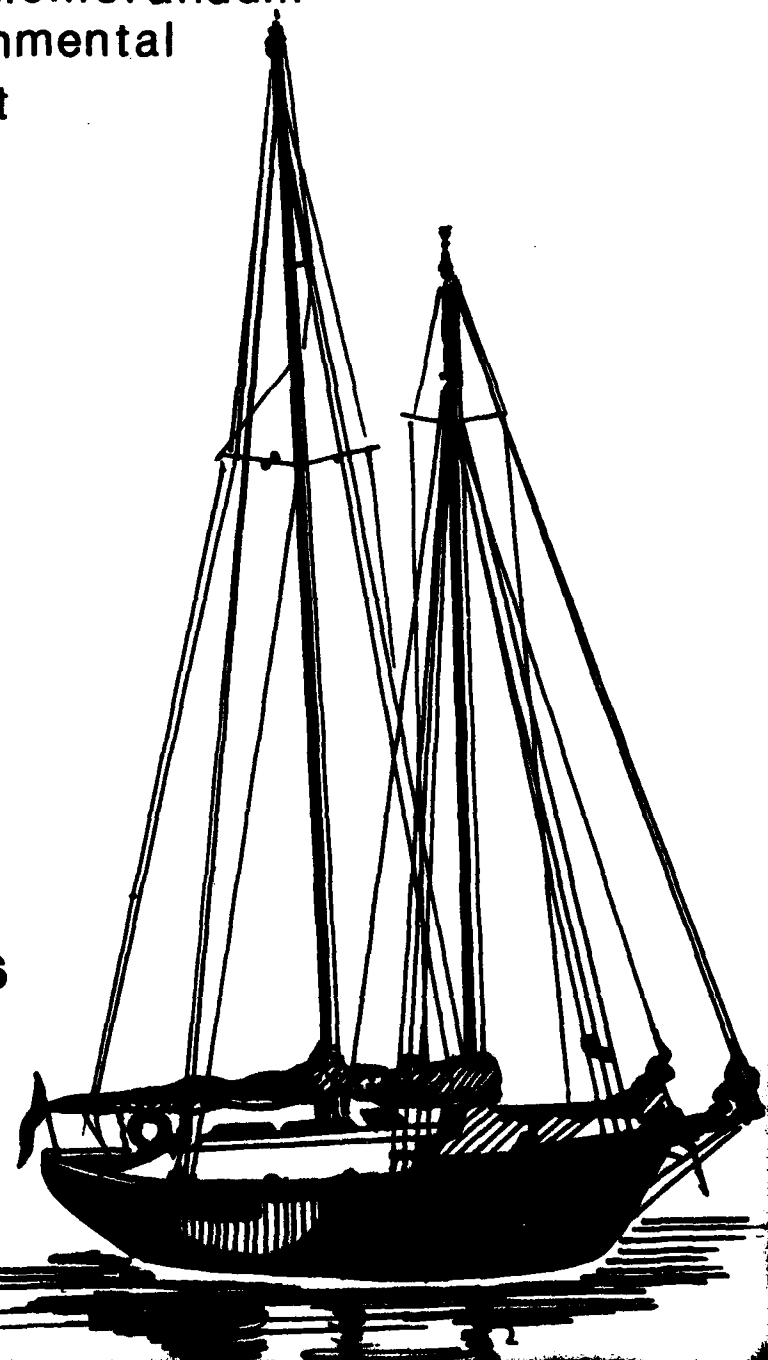
SUPPLEMENTARY

INFORMATION

Geneva-On-The-Lake Ohio
Small- Boat Harbor

Final Reformulation Phase I
General Design Memorandum
and Final Environmental
Impact Statement



US Army Corps of Engineers
Buffalo District

August 1981
(REVISED OCTOBER 1981)

Design and Other Considerations for Harbor and Marina Layout

Channels

Based on a workshop meeting with local boaters on 23 July 1980 (see Exhibit F-7 in Appendix F for summary minutes of this meeting), the Stage 2 criteria of an entrance channel depth of 8 feet below Low Water Datum, an interior channel depth of 6 feet below LWD and 100-foot wide channels were sufficient for the expected fleet at Geneva State Park.

Marina Requirements

For Stage 3 analysis, it was assumed that the marina should have a 360-slip capacity, as suggested by ODNR (the local sponsor), because it would have a less adverse effect on the wetland area and existing park facilities when compared to the larger 400-slip marina.

Support Facilities

For Stage 3, include six launching ramps and a public landing with service facilities in the project design.

Wave Requirements

No change from Stage 2 criteria.

Slope Protection

Vertical Walls - For Stage 3, a diaphram cell wall was assumed for costing purposes. (Note: The assumption of a diaphram cell wall, instead of a reinforced concrete "L" wall as selected in Stage 2, may be overly conservative. The diaphram cell wall was assumed because it can be constructed without dewatering the site. If soil analysis during the Phase II GDM study indicates that the site can be economically dewatered, as expected, a reinforced concrete "L" wall will be substituted for the diaphram cell wall resulting in a cost savings to the project.)

Excavated Material Disposal

No change from Stage 2 criteria.

Mitigation

The need for mitigation of adverse impacts on the wetland area is based upon the fact that wetlands are a scarce, fast disappearing resource along the highly industrialized eastern Ohio shoreline of Lake Erie. In addition, the project area supports several species of Ohio Threatened and Endangered species of plants and animals (see Table 1). The value and uniqueness of the wetland area within the project area is discussed in the U. S. Fish and Wildlife Service's four-season study report (Exhibit G-2 in Appendix G).

Cost-Sharing

Cost-sharing arrangements for mitigation of adverse environmental impacts were not included as items of local cooperation when the Geneva-on-the-Lake Small-Boat Harbor project was authorized for construction in 1970. However, since mitigation of adverse environmental impacts is required (primarily to offset impacts to the wetland area), and Congress has authorized project modifications for mitigation of adverse impacts to fish and wildlife resources under the Fish and Wildlife Coordination Act of 1958 (Public Law 85-624), appropriate cost-sharing arrangements will be added to the Congressionally authorized items of local cooperation. By letter dated 15 April 1981 (see Exhibit E-15 in Appendix E), ODNR, the local project sponsor, has indicated a willingness to provide this additional local cooperation, in addition to the items of local cooperation Congressionally authorized.

Based on a review of current Corps policy for mitigation of adverse environmental impacts, the following cost-sharing arrangements will be included as an item of local cooperation for this project:

a. Mitigation Features - First costs for mitigation features will be cost-shared 50 percent Federal and 50 percent non-Federal. Annual operation and maintenance costs will be cost-shared 50 percent Federal and 50 percent nonFederal. (NOTE: The Federal portion of the annual operation and maintenance cost will be provided to the non-Federal sponsor as a credit towards the first cost of construction in an amount equal to the present value of these costs.)

ALTERNATIVE PLAN 3b - MODIFIED WETLAND/PARKING LOT HARBOR

Description of Plan 3b

Plan 3b would provide an all-weather, onshore harbor with a single berthing area for 360 boats on lands which are presently partly a wetland area and partly lawn and parking areas. The proposed plan is shown on Plate 16 in Appendix H.

The harbor entrance for Plan 3b would be located to take advantage of the existing rock trough and would be protected by an arrowhead breakwater system. Because of the trough, the breakwaters would be relatively short, aggregating about 1,050 feet. Both arms would be shore-connected to prevent shoaling of the navigation channel, to prevent adverse wave conditions in the harbor, and to provide access for fishing from the east breakwater. Because the west breakwater would be remote from existing parking and other park facilities (requiring that additional parking and an access road be constructed to the west and north of the existing wetland area), fishing facilities were not included on the west breakwater although a handrail has been added for safety considerations. A portable sand bypass system has also been incorporated into the project for down-drift nourishment. The portable system would utilize flexible, temporary pipe installed between the arms of the arrowhead breakwater during each bypassing operation in lieu of a permanent pipe system.

The entrance channel would be oriented in a south-southeasterly direction to bypass the mouth of the intermittent stream with the objective of minimizing the impact on the wetland area. The width of the entrance channel would be 100 feet, sufficient for two-way traffic, and the depth would be 8 feet below LWD.

Table 20 - Estimate of Total Project Cost for Alternative Plan 3b and Federal and Non-Federal Share (October 1980 Price Levels)

Item	Amount	Total
	$	$
TOTAL PROJECT COSTS:		
1. Channels	3,143,000	
2. Breakwaters	888,000	
3. Recreational Facilities	56,000 1/	
4. Aids to Navigation	70,000 2/	
5. Lands and Damages	484,000	
6. Engineering and Design	850,000 3/	
7. Supervision and Administration	343,000	
Total Project Cost		5,834,000 4/
FEDERAL SHARE:		
50 percent of Items 1, 2, 3, 6, and 7	2,640,000	
Aids to Navigation (U. S. Coast Guard)	70,000	
Total Federal Share of Project Cost		2,710,000
NON-FEDERAL SHARE:		
Cash Contribution (50 percent of Items 1, 2, 3, 4, 6, and 7)	2,640,000	
Lands and Damages	484,000	
Total Non-Federal Share of Project Cost		3,124,000 5/

1/ To provide walkway and handrail on east breakwater for breakwater fishing.

2/ Cost includes necessary Engineering and Design and Supervision and Administration.

3/ Includes $124,000 for hydraulic model study.

4/ Includes $310,000 for mitigation of adverse environmental impacts.

5/ Does not include costs for self-liquidating features of the project, such as dredging of mooring areas and construction of docks, launching ramps, and public service facilities. The estimated non-Federal cost for these self-liquidating features is $5,920,000 (October 1980 price levels).

Table 21 - Estimated Investment Cost and Annual Charges for Alternative Plan 3b (October 1980 Price Levels) 1/

Item	Navigation	Recreation	Total
	$	$	$
TOTAL INVESTMENT FOR THE PROJECT:			
Total Project Cost, Excluding Lands 2/	5,278,000	72,000	5,350,000
Interest During Construction	389,200	5,400	394,600
Lands and Damages	484,000	0	484,000
Total Investment, Including Lands	6,151,200	77,400	6,228,600
ANNUAL CHARGES FOR THE PROJECT:			
Interest	453,600	5,800	459,400
Amortization	13,300	200	13,500
Maintenance	98,500	1,800	100,300
Total Annual Charges	565,400	7,800	573,200
FEDERAL SHARE			
Total Investment Cost			
Total Project Cost	2,674,000	36,000	2,710,000
Interest During Construction	197,200	2,700	199,900
Total Investment	2,871,200	38,700	2,909,900
Annual Charges			
Interest	211,700	2,900	214,600
Amortization	6,200	100	6,300
Maintenance	95,550 3/	0	95,550
Total Annual Charges	313,450	3,000	316,450
NON-FEDERAL SHARE:			
Total Investment Cost, Including Lands			
Total Project Cost, Excluding Lands	2,604,000	36,000	2,640,000
Interest During Construction	192,000	2,700	194,700
Lands and Damages	484,000	0	484,000
Total Investment, Including Lands	3,280,000 4/	38,700	3,318,700
Annual Charges			
Interest	241,900	2,900	244,800
Amortization	7,100	100	7,200
Maintenance	2,950 5/	1,800 6/	4,750
Total Annual Charges	251,950	4,800	256,750

1/ 7-3/8 percent interest rate, 50-year life (i = .07375, amort. = .00216).

2/ Includes cost for mitigation of adverse environmental impacts.

3/ 100 percent Federal for general navigation ($92,600) and 50 percent Federal for mitigation ($2,950).

4/ Excludes $5.92 million for self-liquidating costs.

5/ 50 percent non-Federal for mitigation.

6/ 100 percent non-Federal.

Table 24 - Estimate of Total Project Cost for Alternative Plan 3b and Federal and Non-Federal Share (August 1981 Price Levels)

Item	Amount	Total
	$	$
TOTAL PROJECT COSTS:		
1. Channels	3,426,000	
2. Breakwaters	956,000	
3. Recreational Facilities	61,000 1/	
4. Aids to Navigation	76,000 2/	
5. Lands and Damages	493,000	
6. Engineering and Design	914,000 3/	
7. Supervision and Administration	383,000	
Total Project Cost		6,309,000 4/
FEDERAL SHARE:		
50 percent of Items 1, 2, 3, 6, and 7	2,870,000	
Aids to Navigation (U. S. Coast Guard)	76,000	
Total Federal Share of Project Cost		2,946,000
NON-FEDERAL SHARE:		
Cash Contribution (50 percent of Items 1, 2, 3, 4, 6, and 7)	2,870,000	
Lands and Damages	493,000	
Total Non-Federal Share of Project Cost		3,363,000 5/

1/ To provide walkway and handrail on east breakwater for breakwater fishing.
2/ Cost includes necessary Engineering and Design and Supervision and Administration.
3/ Includes $124,000 for hydraulic model study.
4/ Includes $332,000 for mitigation of adverse environmental impacts.
5/ Does not include costs for self-liquidating features of the project, such as dredging of mooring areas and construction of docks, launching ramps, and public service facilities. The estimated non-Federal cost for these self-liquidating features is $6,340,000 (August 1981 price levels).

Table 25 - Estimated Investment Cost and Annual Charges for Alternative Plan 3b (August 1981 Price Levels) 1/

Item	Navigation	Recreation	Total
	$	$	$
TOTAL INVESTMENT FOR THE PROJECT:			
Total Project Cost, Excluding Lands 2/	5,736,000	80,000	5,816,000
Interest During Construction	423,000	6,000	429,000
Lands and Damages	493,000	0	493,000
Total Investment, Including Lands	6,652,000	86,000	6,738,000
ANNUAL CHARGES FOR THE PROJECT:			
Interest	490,500	6,400	496,900
Amortization	14,300	200	14,500
Maintenance	107,200	2,000	109,200
Total Annual Charges	612,000	8,600	620,600
FEDERAL SHARE:			
Total Investment Cost			
Total Project Cost	2,906,000	40,000	2,946,000
Interest During Construction	214,300	3,000	217,300
Total Investment	3,120,300	43,000	3,163,300
Annual Charges			
Interest	230,100	3,200	233,300
Amortization	6,700	100	6,800
Maintenance	104,000 3/	0	104,000
Total Annual Charges	340,800	3,300	344,100
NON-FEDERAL SHARE:			
Total Investment Cost, Including Lands			
Total Project Cost, Excluding Lands	2,830,000	40,000	2,870,000
Interest During Construction	208,700	3,000	211,700
Lands and Damages	493,000	0	493,000
Total Investment, Including Lands	3,531,700 4/	43,000	3,574,700
Annual Charges			
Interest	260,400	3,200	263,600
Amortization	7,600	100	7,700
Maintenance	3,200 5/	2,000 6/	5,200
Total Annual Charges	271,200	5,300	276,500

1/ 7-3/8 percent interest rate, 50-year life (i = .07375, amort. = .00216).
2/ Includes cost for mitigation of adverse environmental impacts.
3/ 100 percent Federal for general navigation ($100,800) and 50 percent Federal for mitigation ($3,200).
4/ Excludes $6.34 million for self-liquidating costs.
5/ 50 percent non-Federal for mitigation.
6/ 100 percent non-Federal.

SECTION VII
RECOMMENDATION

I recommend that a small-boat harbor and harbor-of-refuge and recreational fishing facilities be constructed as an integral part of the State Park at Geneva-on-the-Lake, OH. I further recommend that the selected plan of improvement, known as Alternative Plan 3b, (Modified Wetland/Parking Lot Harbor) and shown on Plate 16 in Appendix H, as formulated in this Reformulation Phase I General Design Memorandum, be used as a basis for the Phase II General Design Memorandum. The total first cost of the project, on August 1981 price levels, is $5,816,000 1/ consisting of: $2,870,000 Corps of Engineers; $76,000 U.S. Coast Guard; and $2,870,000 non-Federal. These recommendations are made with the understanding that non-Federal interests must furnish assurances satisfactory to the Secretary of the Army that they will:

(1) Provide without cost to the United States all lands, easements, and rights-of-way required for construction and subsequent maintenance of the project and for aids to navigation upon the request of the Chief of Engineers, including suitable areas determined by the Chief of Engineers to be required in the general public interest for initial and subsequent disposal of spoil, and also necessary retaining dikes, bulkheads, and embankments therefore or the cost of such retaining works;

(2) Hold and save the United States free from damages due to the construction and subsequent maintenance of the improvements except for damages due to the fault or negligence of the United States or its Contractors:

(3) Provide and maintain necessary access roads, mooring facilities, and parking and service areas, including a launching ramp, all essential sanitary facilities, and an adequate public landing or wharf, with provisions for the sale of motor fuel, lubricants, and potable water, available to all on equal terms;

(4) Provide and maintain depths in the service channels to principal docks and berthing areas commensurate with those provided in the Federal project;

(5) Accomplish without cost to the United States such relocations or alterations of utilities as necessary for project purposes;

(6) Establish rules to control the use, growth, and development of the harbor and related facilities, with the understanding that public facilities will be open to all on equal terms;

(7) Reserve spaces within the harbor adequate for the accommodation of transient craft;

(8) Establish regulations prohibiting discharge of pollutants into the waters of the harbor area by users thereof, which regulations shall be in

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1/ $6,309,000 (see Table 24) minus $493,000 economic cost for lands and damages.

accordance with applicable laws or regulations of Federal, State, and local authorities responsible for pollution prevention and control;

(9) Contribute in cash 50 percent of that portion of the first cost of Federal construction allocated to recreational navigation, exclusive of aids to navigation, a contribution presently estimated at $2,664,000 on August 1981 price levels, to be paid in a lump sum prior to initiation of construction, or in installments over the construction period at a rate proportionate to the proposed or scheduled expenditure of Federal funds, as required by the Chief of Engineers, the final apportionment of cost to be made after actual costs have been determined;

(10) Contribute in cash one-half of the cost of modifications necessary to provide for recreational fishing from the breakwaters, an amount currently estimated at $40,000 on August 1981 price levels;

(11) Bear all costs of maintenance, operation, and replacement of these modifications for recreational fishing, an amount currently estimated at $2,000 on August 1981 price levels on an average annual basis;

(12) Comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (Public Law 91-646 approved 2 January 1971) in acquiring land, easements, and rights-of-way for construction and subsequent maintenance of the project and inform affected persons of pertinent benefits, policies, and procedures in connection with said Act;

(13) Provide without cost to the United States all lands, easements, and rights-of-way required for construction and subsequent maintenance of the mitigation features of the project. Contribute in cash 50 percent of that portion of the first cost of Federal construction allocated to mitigation of adverse environmental impacts, a contribution presently estimated at $166,000 on August 1981 price levels, to be paid in a lump sum prior to initiation of construction, or in installments over the construction period at a rate proportionate to the proposed or scheduled expenditures of Federal funds, as required by the Chief of Engineers, the final apportionment of cost to be made after actual costs have been determined; and

(14) Contribute 50 percent of all costs of maintenance, operation, and replacement of these mitigation features, an amount currently estimated at $3,200 on August 1981 price levels, on an average annual basis and be solely responsible for the physical operation, maintenance, and replacement of these features. The Federal portion of the costs of maintenance, operation, and replacement of these mitigation features, an amount currently estimated at $3,200 on August 1981 price levels, on an average annual basis will be provided to the non-Federal local sponsor as a credit towards the first cost of construction in an amount equal to the present value of these costs, an amount currently estimated at $42,000 on August 1981 price levels and 7-3/8 percent interest rate.

And provided further, that the improvement for navigation may be undertaken independently of providing public recreational facilities for breakwater fishing whenever the required local cooperation for navigation has been furnished.

GEORGE P. JOHNSON
Colonel, Corps of Engineers
Commanding

Table C10 - Estimate of Annual Charges 1/
Alternative No. 4

Item	Federal	Non-Federal 2/	Total 2/
	$	$	$
First Cost	1,668,000	1,640,000	3,308,000
Interest During Construction	123,000	121,000	244,000
Total Investment Cost	1,791,000	1,761,000	3,552,000
Lands and Damages	0	135,000	135,000
Total Project Costs	1,791,000	1,896,000	3,687,000
Annual Charges			
Interest	132,100	139,800	271,900
Amortization	3,900	4,100	8,000
Maintenance	32,400	4,500	36,900
Total	168,400	148,400	316,800

1/ Based on October 1980 price levels, 7-3/8 percent interest rate, and a 50-year economic life.

2/ Does not include self-liquidating cost for mooring area, launching ramps, and public service facilities currently estimated at $4,370,000 (October 1980 price levels).

Table C11 - Estimate of Annual Charges 1/
Alternative 3b

Item	Federal			Non-Federal 2/			Total 2/		
	Navigation	Recreational Fishing	Total	Navigation	Recreational Fishing	Total	Navigation	Recreational Fishing	Total
	$	$	$	$	$	$	$	$	$
First Cost	2,674,000	36,000	2,710,000	2,604,000	36,000	2,640,000	5,278,000	72,000	5,350,000
Interest During Construction	197,200	2,700	199,900	192,000	2,700	194,700	389,200	5,400	394,600
Total Investment Cost	2,871,200	38,700	2,909,900	2,796,000	38,700	2,834,700	5,667,200	77,400	5,744,600
Lands and Damages	0	0	0	484,000	0	484,000	484,000	0	484,000
Total Project Costs	2,871,200	38,700	2,909,900	3,280,000	38,700	3,318,700	6,151,200	77,400	6,228,600
Annual Charges									
Interest	211,700	2,900	214,600	241,900	2,900	244,800	453,600	5,800	459,400
Amortization	6,200	100	6,300	7,100	100	7,200	13,300	200	13,500
Maintenance	95,550	0	95,550	2,950	1,800	4,750	98,500	1,800	100,300
Total	313,450	3,000	316,450	251,950	4,800	256,750	565,400	7,800	573,200

1/ Based on October 1980 price levels, 7-3/8 percent interest rate, and a 50-year economic life.

2/ Does not include self-liquidating cost for mooring area, launching ramps, and public service facilities currently estimated at $5,920,000 (October 1980 price levels).

Table C11a - Estimate of Annual Charges 1/
Alternative 3b

Item	Federal			Non-Federal 2/			Total 2/		
	Navigation	Recreational Fishing	Total	Navigation	Recreational Fishing	Total	Navigation	Recreational Fishing	Total
	$	$	$	$	$	$	$	$	$
First Cost	2,906,000	40,000	2,946,000	2,830,000	40,000	2,870,000	5,736,000	80,000	5,816,000
Interest During Construction	214,300	3,000	217,300	208,700	3,000	211,700	423,000	6,000	429,000
Total Investment Cost	3,120,300	43,000	3,163,300	3,038,700	43,000	3,081,700	6,159,000	86,000	6,245,000
Lands and Damages	0	0	0	493,000	0	493,000	493,000	0	493,000
Total Project Costs	3,120,300	43,000	3,163,300	3,531,700	43,000	3,574,700	6,652,000	86,000	6,738,000
Annual Charges									
Interest	230,100	3,200	233,300	260,400	3,200	263,600	490,500	6,400	496,900
Amortization	6,700	100	6,800	7,600	100	7,700	14,300	200	14,500
Maintenance	104,000	0	104,000	3,200	2,000	5,200	107,200	2,000	109,200
Total	340,800	3,300	344,100	271,200	5,300	276,500	612,000	8,600	620,600

1/ Based on August 1981 price levels, 7-3/8 percent interest rate, and a 50-year economic life.

2/ Does not include self-liquidating cost for mooring area, launching ramps, and public service facilities currently estimated at $6,340,000 (August 1981 price levels).

Table D21 - Total Project Costs - Geneva-on-the-Lake 1/
Alternative 3b

Item	Federal			Non-Federal 2/			Total 2/		
	Navigation	Recreational Fishing	Total	Navigation	Recreational Fishing	Total	Navigation	Recreational Fishing	Total
First Cost	2,674,000	36,000	2,710,000	2,604,000	36,000	2,640,000	5,278,000	72,000	5,350,000
Interest During Construction	197,200	2,700	199,900	192,000	2,700	194,700	389,200	5,400	394,600
Total Investment Cost	2,871,200	38,700	2,909,900	2,796,000	38,700	2,834,700	5,667,200	77,400	5,744,600
Lands and Damages	0	0	0	484,000	0	484,000	484,000	0	484,000
Total Project Costs	2,871,200	38,700	2,909,900	3,280,000	38,700	3,318,700	6,151,200	77,400	6,228,600
Annual Charges									
Interest	211,700	2,900	214,600	241,900	2,900	244,800	453,600	5,800	459,400
Amortization	6,200	100	6,300	7,100	100	7,200	13,300	200	13,500
Maintenance	95,550	0	95,550	2,950	1,800	4,750	98,500	1,800	100,300
Total	313,450	3,000	316,450	251,950	4,800	256,750	565,400	7,800	573,200

1/ Based on October 1980 price levels, 7-3/8 percent interest rate, and a 50-year economic life.

2/ Does not include self-liquidating cost for mooring area, launching ramps, and public service facilities currently estimated at $5,920,000 (October 1980 price levels).

Table D22 - Economic Efficiency 1/

Item	Investment Cost	Average Annual Benefits	Average Annual Costs	B/C Ratio	Net Discounted Benefits	Payback Period
	$	$	$		$	
2.5 Persons Per Boat						
Recreational Navigation	6,151,200	846,200	565,400	1.50	280,800	-
Recreational Fishing	77,400	26,600	7,800	3.41	18,800	-
Total	6,228,600	872,800	573,200	1.52	299,600	7 years
3.0 Persons Per Boat						
Recreational Navigation	6,151,200	846,200	565,400	1.50	280,800	-
Recreational Fishing	77,400	26,600	7,800	3.41	18,800	-
Total	6,228,600	872,800	573,200	1.52	299,600	7 years

1/ Given a 7-3/8 percent interest rate, 50-year project life, October 1980 price levels.

Table D24 - Estimate of Annual Charges 1/
Alternative 3b

Item	Federal			Non-Federal 2/			Total 2/		
	Navigation	Recreational Fishing	Total	Navigation	Recreational Fishing	Total	Navigation	Recreational Fishing	Total
	$	$	$	$	$	$	$	$	$
First Cost	2,906,000	40,000	2,946,000	2,830,000	40,000	2,870,000	5,736,000	80,000	5,816,000
Interest During Construction	214,300	3,000	217,300	208,700	3,000	211,700	423,000	6,000	429,000
Total Investment Cost	3,120,300	43,000	3,163,300	3,038,700	43,000	3,081,700	6,159,000	86,000	6,245,000
Lands and Damages	0	0	0	493,000	0	493,000	493,000	0	493,000
Total Project Costs	3,120,300	43,000	3,163,300	3,531,700	43,000	3,574,700	6,652,000	86,000	6,738,000
Annual Charges									
Interest	230,100	3,200	233,300	260,400	3,200	263,600	490,500	6,400	496,900
Amortization	6,700	100	6,800	7,600	100	7,700	14,300	200	14,500
Maintenance	104,000	0	104,000	3,200	2,000	5,200	107,200	2,000	109,200
Total	340,800	3,300	344,100	271,200	5,300	276,500	612,000	8,600	620,600

1/ Based on August 1981 price levels, 7-3/8 percent interest rate, and a 50-year economic life.

2/ Does not include self-liquidating cost for mooring area, launching ramps, and public service facilities.

Table D25 - Economic Efficiency

Item	Investment Cost	Average Annual Benefits	Average Annual Costs	B/C Ratio	Net Discounted Benefits	Payback
	$	$	$		$	
		2.5 Persons Per Boat				
Recreational Navigation	6,652,000	896,000	612,000	1.46	284,000	-
Recreational Fishing	86,000	28,200	8,600	3.28	19,600	-
Total	6,738,000	924,200	620,600	1.49	303,600	7 years
		3.0 Persons Per Boat				
Recreational Navigation	6,652,000	896,000	612,000	1.46	284,000	-
Recreational Fishing	86,000	28,200	8,600	3.28	19,600	-
Total	6,738,000	924,200	620,600	1.49	303,600	7 years

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